"ONYCHOSCOPIC NAIL CHANGES IN PATIENTS WITH CHRONIC KIDNEY DISEASE: A CROSS-SECTIONAL STUDY."

BY

DR. YERAGONDA SUSMITHA, M.B.B.S.

DISSERTATION SUBMITTED TO

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR, KARNATAKA,

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF

DOCTOR OF MEDICINE

(M.D.) IN

DERMATOLOGY, VENEREOLOGYAND LEPROSY

UNDER THE GUIDANCE OF

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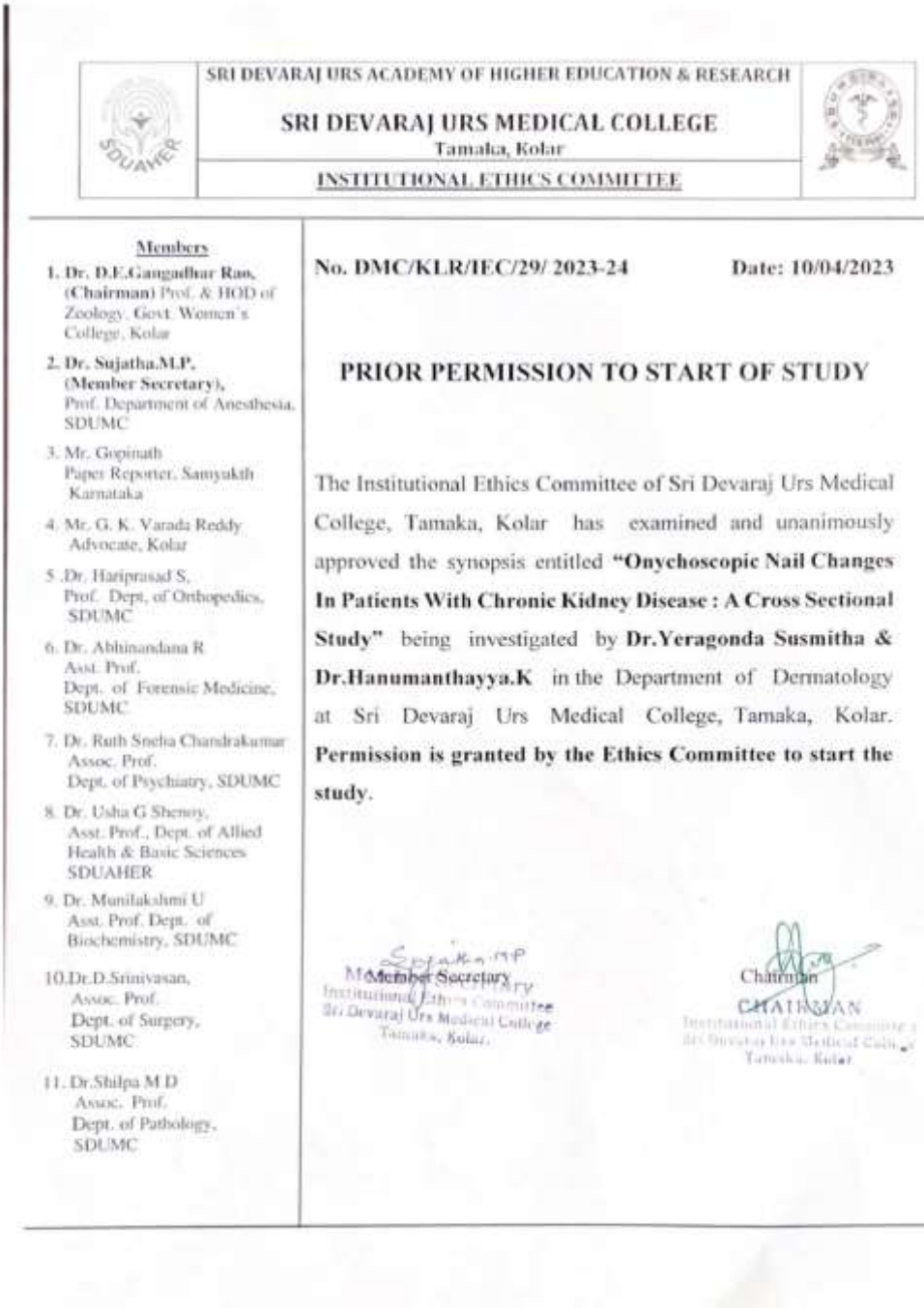

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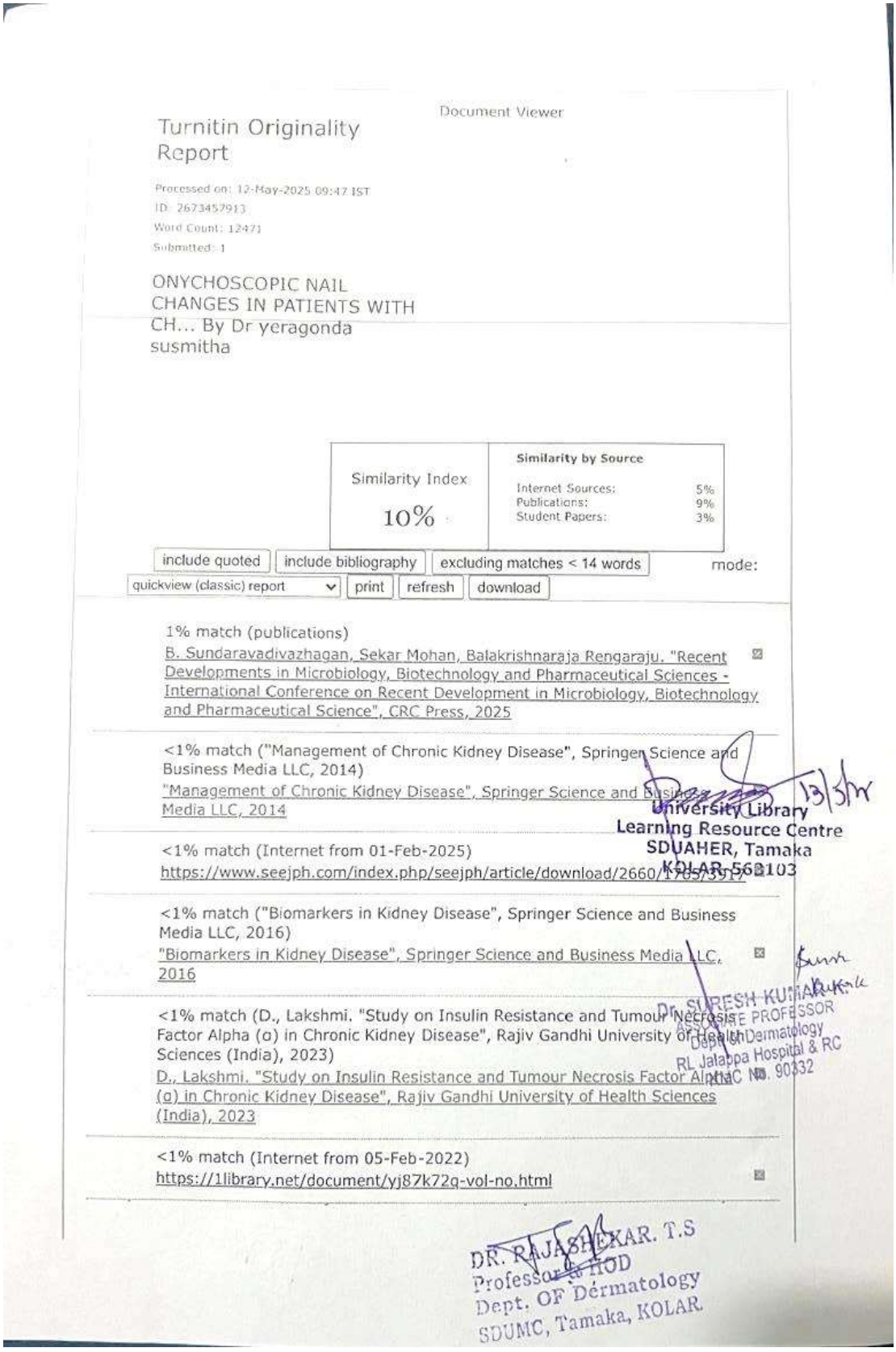

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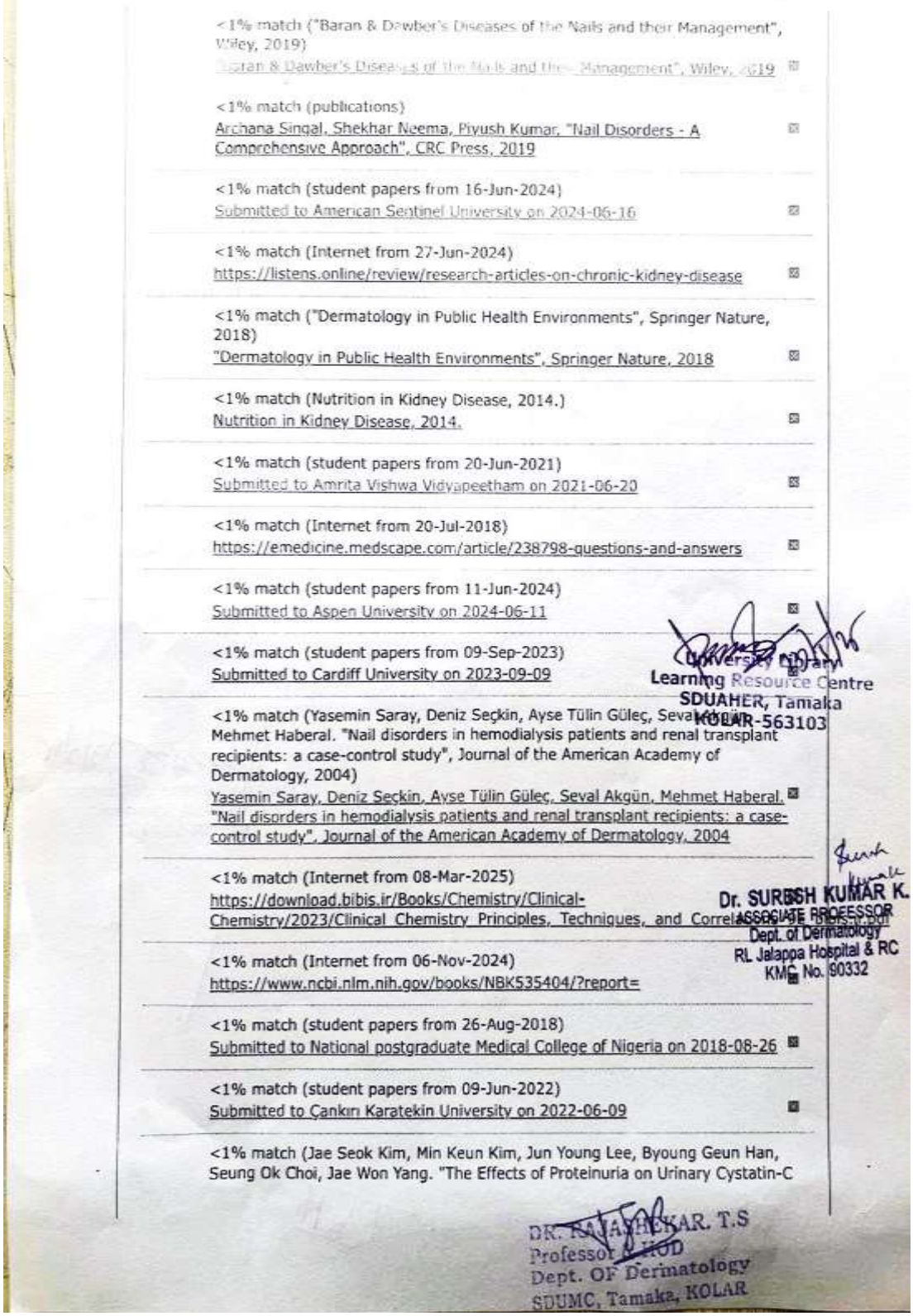

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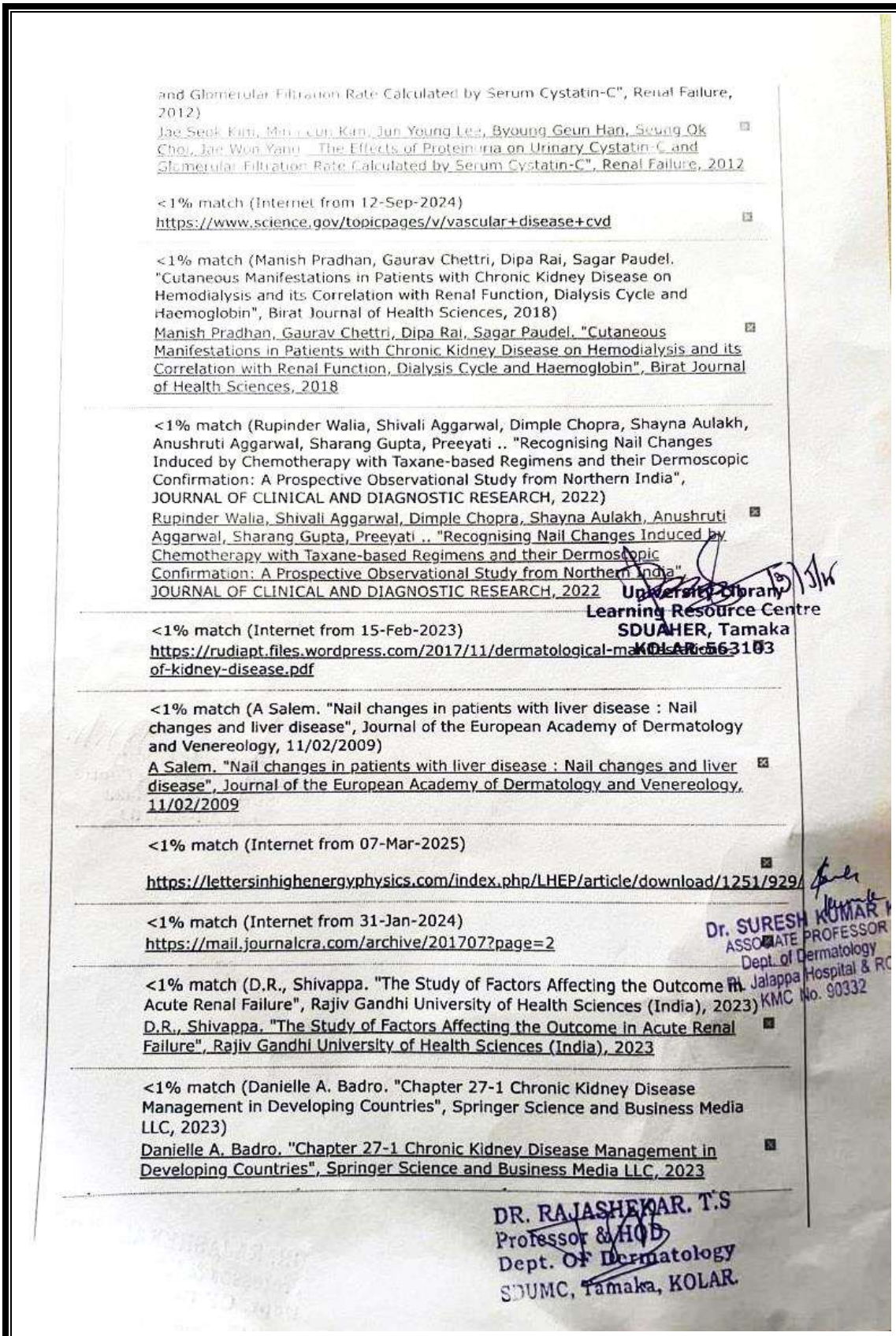

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I am deeply indebted and grateful to my guide ***Dr. Suresh kumar.*** *K, Associate Professor, Department of Dermatology, Venereology and Leprosy, Sri Devaraj Urs*
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I must express my gratitude to who have been my closest friends at every stage Of
my life, for teaching me the realities of both my personal and professional lives. No
words can express the gratitude I feel towards my beloved parents, ***Mr. Raja Reddy.Y*** *and* ***Mrs. Lakshmi Devi.Y*** *whose countless sacrifices and endless love has made me who I am today in life.*

I also thank my brother ***Mr. Yashwanth Gandhi Reddy.Y*** *and Sister-in-law* ***Mrs. Ramya. Y*** *for their motivation and for being a constant source of support and encouragement.*

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help. I also thank my beloved juniors ***Dr. Swathi Ganesh Shenoy, Dr. Bommaka Sruthi and Dr. M Yashaswini, Dr. Kenkre Namrata Sandeep, Dr. Swathi Ganesh Shenoy, Dr. Callista*** *Juneja for their endless support.*

I am truly blessed in having the most wonderful friends and would like to thank them
For their endless support.

I will be failing my duty if I do not thank all my patients involved in this study, withoutwhose co-operation and patience this study would have been impossible.

Last, but not the least, I would like to express mygratitude to the Almighty for all his blessings.

DATE: SIGNATURE OF CANDIDATE

PLACE: KOLAR **DR. YERAGONDA SUSMITHA**

LIST OF ABBREVIATIONS USED

ACR - albumin - creatinine ratio

CKD – chronic kidney disease

DSCs- dysmorphic red cells

eGFR – estimated glomerular filtration rate

ESRD - end-stage renal disease

FSGS - Focal segmental glomerulosclerosis

GFR – Glomerular filtration rate

MGN - Membranous glomerulonephritis

CRF – Chronic renal failure

HD – Haemodialysis

RBCs – Red blood cells

UV – Ultraviolet

WBC – White blood cells

PKD - Polycystic kidney disease

CIPN - Chronic interstitial nephritis

KDOQI - Kidney Disease Outcomes Quality Initiative

CVD - Cardiovascular disease

ADPKD - Autosomal Dominant Polycystic Kidney Disease

RAAS - renin-angiotensin-aldosterone system

ABPM - ambulatory blood pressure monitoring

AKI – Acute kidney injury

BUN – Blood urea and nitrogen

FGF23 - fibroblast growth factor 23

CRIC - Chronic Renal Insufficiency Cohort

ANCA - anti-neutrophil cytoplasmic antibodies

AV – Arteriovenous

ACE - angiotensin-converting enzyme

PTH – parathyroid hormone

DDAVP – Desmopressin

CAD - coronary artery disease

PND - Pincer nail deformity

SPSS – Statistical package for social services

ABSTRACT

TITLE: ONYCHOSCOPIC NAIL CHANGES IN PATIENTS WITH CHRONIC KIDNEY DISEASE: A CROSS-SECTIONAL STUDY

Background: Nail changes can present critical clue for core internal issues and dermatological disease. Chronic kidney disease (CKD) is defined as "glomerular filtration rate (GFR) below60ml/min per 1.73 m^2 for three months or more". Nail changes occurrence in chronic kidneydiseases among various populations varies. It ranges from 60 to 75% in different studies.

Objectives:

- To evaluate the prevalence of various nail manifestations in patients with chronic kidney disease.
- To study the Onychoscopic changes of various Nail manifestations in the patients of chronic kidney disease.

Methods: This was a cross sectional study conducted among 314 patients diagnosed With chronic kidney disease. Nail manifestations were evaluated clinically as well as with the help of a dermascope. All the statistical analyses were carried out at a 5% level of significance, results with the P value < 0.05 were considered statistically significant.

Results and interpretation: In this study, onychoscopic changes were present in almost 82.8% of the study population. The most common nail change identified in this study was onycholysis (29.9%), followed by leukonychia (24.2%), Splinter hemorrhage (23.9%), melanonychia (23.6%) and longitudinal ridges (21.0%). In the current study the most common nail changes identified among patients with stage 1 CKD was splinte haemorrhage (44.8%)

Conclusion: Various nail changes are present in patients with chronic kidney disease Ranging from the common onycholysis to much rare Meuhrcke's lines. The prevalence of various naildeformities changed with the stage of the chronic kidney disease. Systematic nail examination of uraemic patients is useful because of the frequent nail changes observed.

Keywords: Dermascope, Chronic Kidney Disease, Onycholysis, Leukonychia, Splinter hemorrhages.

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INTRODUCTION

INTRODUCTION

The nail is "a distinctive structure whose component parts are collectively called the nail unit. The nail unit consists of the nail matrix, nail bed, hyponychium and the proximal and lateral nail folds."[1] Nail changes can present critical clue for core internal issues and dermatological disease. Onychosopy is "the examination of the nail unit using a Dermoscope."[2]

Neither a visual examination nor a nail biopsy can definitively diagnose all nail problems. When it comes to diagnosing nail problems, onychoscopy is a lifesaver since it magnifies both the apparent nail characteristics and the less obvious ones.[3]

Chronic kidney disease (CKD) is defined as "glomerular filtration rate (GFR) below 60ml/min per 1.73 m^2 for three months or more". In CKD renal functions progressively decline, in which patient needs replacement therapy in order to retain normal functions of kidney.[4] Multiple systems of human body including the nervous, enteric, cardiac, respiratory, and many other systems are affected by CRF.[5] Skin changes may commence from early stage of renal impairment to the last stages of renal disease. These dermal manifestations also observed in patents with haemodialysis and after kidney transplantation. It has been observed that more than half of the patients with end stage kidney disease develop skin changes. Xerosis, pruritus, pallor, pigmentary changes, acquired perforating dermatoses and nail changes are frequently reported skin manifestations.

Nail changes occurrence in chronic kidney diseases among various populations varies. It ranges from 60 to 75% in different studies. The precise etiopathogenesis of nail problems in CKD is still unknown. Even with replacement therpay for renal failure ,nail problems typically continue to exist. Half-and-half nails, lunula absence, onychomycosis,leuconychia, onycholysis, and splinter hemorrhage are among the most often observed nail abnormalities. Multiple studies have been carried out previously to assess skin and nail changes in patients with CKD . The main rationale of carrying out this study was that internationally, there is limited data availability of such studies that investigate nail changes in CKD. Thus, this study will help in estimation of the extent of the disease and offer the patients timely diagnosis and treatment to decrease the morbidity.

This study was carried out with objective to analyse the occurrence of nail manifestations in chronic kidney disease patients and to study the onychoscopic changes of various nail manifestations in patients of chronic kidney disease.

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REVIEW OF LITERATURE

REVIEW OF LITERATURE

NAIL

In addition to providing protection for the fingers, the nail also helps with tactile perception. The pathophysiology behind many nail presentations may be better understood with a firm grasp of nail anatomy, which is in turn crucial for physiology. Nails may be a clinical manifestation of various systemic and cutaneous illnesses. The aetiology of nail findings may frequently be determined with a complete history and physical, but a biopsy may still be needed to confirm the diagnosis. Since difficulties might arise from injuries 'to the key blood arteries' and nerves that feed the nail, it is crucial to understand the anatomy before taking tissue samples.

Anatomy and physiology

The many soft tissue components make up a nail assist to shape and support the hard outer layer, which is called the nail plate. The accompanying graphic illustrates the general structures that are detailed below.

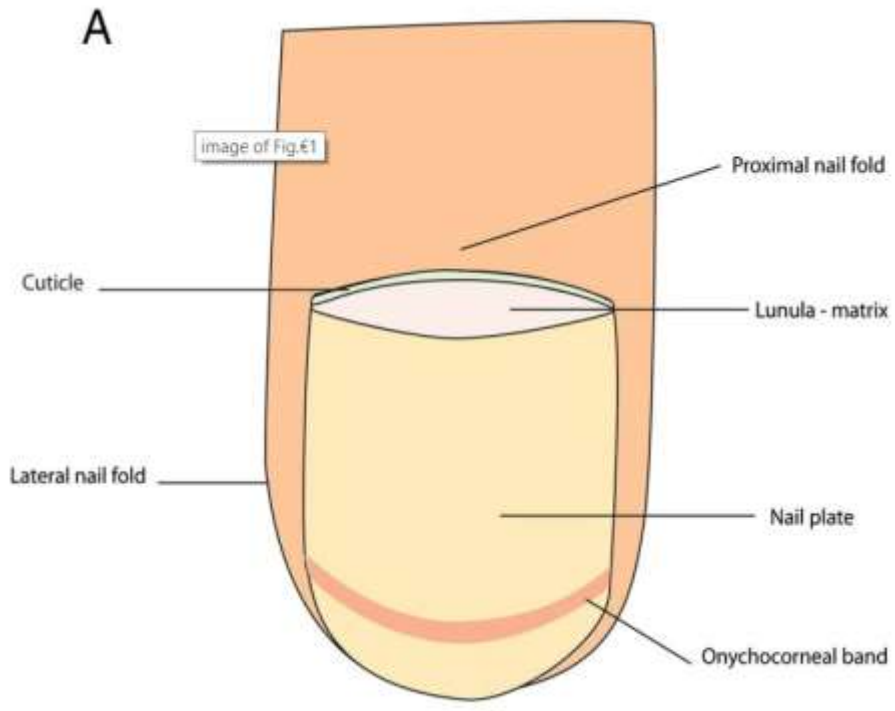


Figure 1: Gross anatomy of nail

Nail Folds

Soft tissue features called nail folds shield the nail plate's proximal and lateral margins. To prevent damage and UV radiation, the majority nail matrix is shielded by the proximal nail fold.[6]

Mantle

The nail plate's matrix and base are covered by the mantle, which is the outer layer of skin.

Cuticle

In order to prevent outside forces from damaging the underlying matrix, in tandem to create a protective barrier.[6]

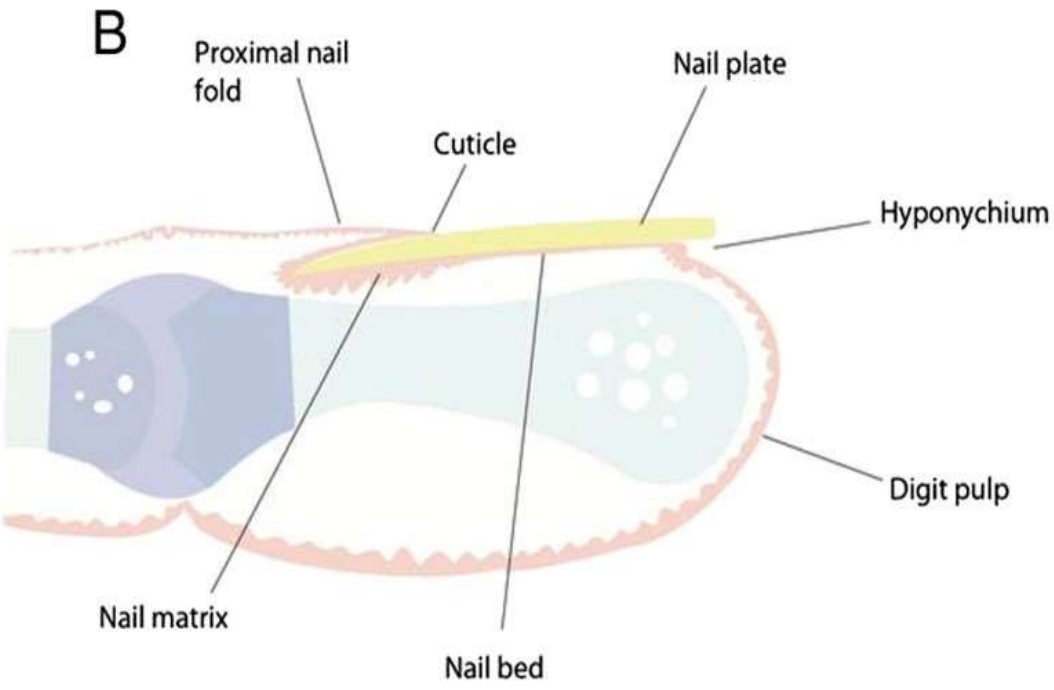


Figure 2: Sagittal view of the nail

Onychodermal Band

An area of the distal nail bed that is shown in a hue is the onychodermal band. Similar to the cuticle, it protects the proximal part of nail by acting as first barrier. Various disorders or changes in vascular supply may be correlated with changes in colour.[6]

Embryology of nail

Around the eighth week of gestation, the nail begins to show as a ridge on the fingers. The proximal fold develops at 14 weeks, and the basic nail unit becomes visible at 16 weeks. The nail bed is entirely covered by a fully developed nail plate during 5 months of gestation.[6]

Figure 3: Development of nails

Research shows that there is an embryologic link between the nail and the underlying distal phalanx, and that this relationship varies both during and after birth. When it comes to the development of fingernails and bones, signaling molecules such bone morphogenic proteins are involved. Bifid phalanx and other underlying bone abnormalities have been linked to congenital nail dystrophies.[6]Nail symptoms are more common in adults with psoriatic arthritis.[7]The proximal nail matrix may be disrupted by inflammation of the surrounding joint and bone, leading to crumbling or pitting of the nail.

Blood Supply and Lymphatics

Even if the fingers clench onto anything, the nail unit's abundant blood supply and many anastomotic channels will keep blood flowing normally.

The radial and ulnar arteries divide the hand into two arches, one superficial and one deep, that supply the palms. The majority of blood flow to the fingers is supplied by

the superficial palmar arch, which branches off into the common digital arteries.[8]The two correct digital arteries branch out from each common digital artery and run laterally beside each finger.[8]After that, it divides into the dorsal digital arteries just before distal interphalangeal joint. After passing through the distal interphalangeal joint, the dorsal digital branch eventually forms the superficial arcade.[8]This twisted artery nourishes the nail fold and matrix as it passes transversely around half a centimetre prior to the cuticle.[6] The small vessels of the nail unit vary greatly in anatomy, but all of the ones on the tips of the fingers have a distinctive tortuosity that protects them against blockage.[8]

The circulatory system is distinct Cavernous blood arteries, or glomus bodies, are an element of the nail unit. Bypassing a capillary bed, these end-organ devices called arteriovenous anastomoses. The cuboidal epithelial cells and pericytes that surround these structures contract at different rates than the arterioles.[6]The glomus bodies dilate and the arterioles that supply them narrow in cold weather. They help maintain a steady core temperature and keep blood flowing even when temperatures drop.[8]

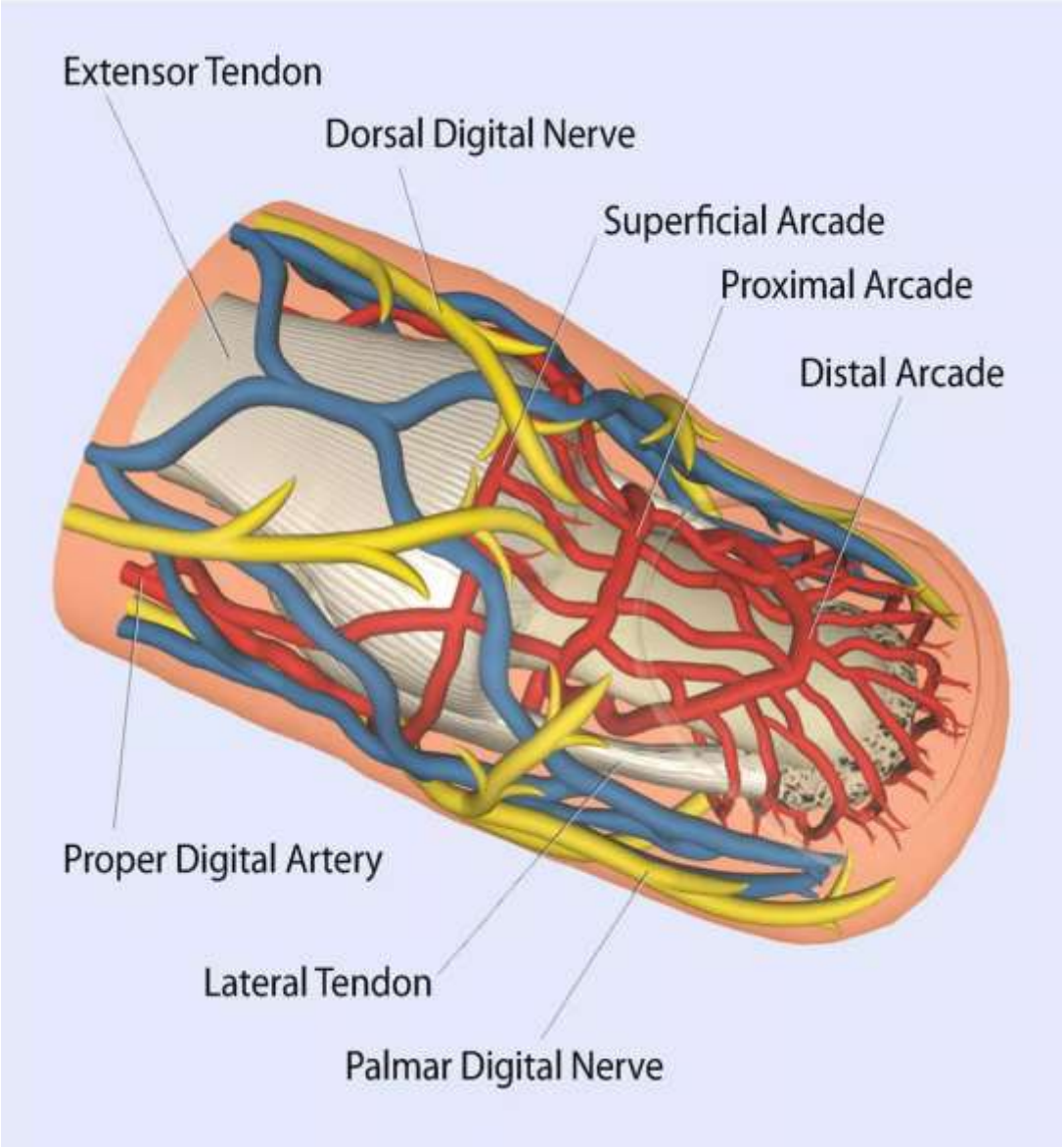


Figure 4: Arterial supply and nervous supply of nail

Nerves

Since the fingers are in charge of fine tactile discernment, the distal digits get a lot of neuronal innervation. Just like the vascular supply, the nerves that innervate the nail unit are quite similar. Each finger is innervated on the palmar and dorsal surfaces by a pair of digital nerves.[6] Subsequently, it divides into three branches that feed the distal finger pulp and the remaining nail unit.[8]

When operating on a nail, it is essential to take the surrounding anatomy and the nail unit's structure into account. If the surgeon is aware of the tissue's neural innervation and blood supply, the operation should go more smoothly.

After the nail has been cleansed well, the patient should be given an anesthetic to make sure they don't feel any discomfort throughout the procedure. Lidocaine, mepivacaine, or prilocaine are all examples of local anesthetics that may be employed. Since patients may experience considerable pain after nail surgery after the local anesthetic wears off, one author recommends ropivacaine as an alternative anesthetic because of its lengthy duration of action.[9]A wide variety of digital anesthetic procedures are available. An effective and widely used method, the proximal digital block provides a deep anesthetic. Although it is beneficial for all nail surgeries, ischemia may occur from artery compression caused by injecting too much volume.[8,9]To prevent this ischemia consequence while still providing the benefit of appropriate anesthetic, local injection around the nail unit might be used. The use of transthecal anesthetic is another alternative. For numbers in the second, third, or fourth decimal places, this method works. The flexor digitorum tendon sheath is injected with the local anesthetic via the metacarpophalangeal volar joint crease. Additionally, this method protects the neurovascular bundles in the fingers against injury and ischemia problems.[9]

Nail biopsies may be required for pathologic confirmation of a nail disease diagnosis.

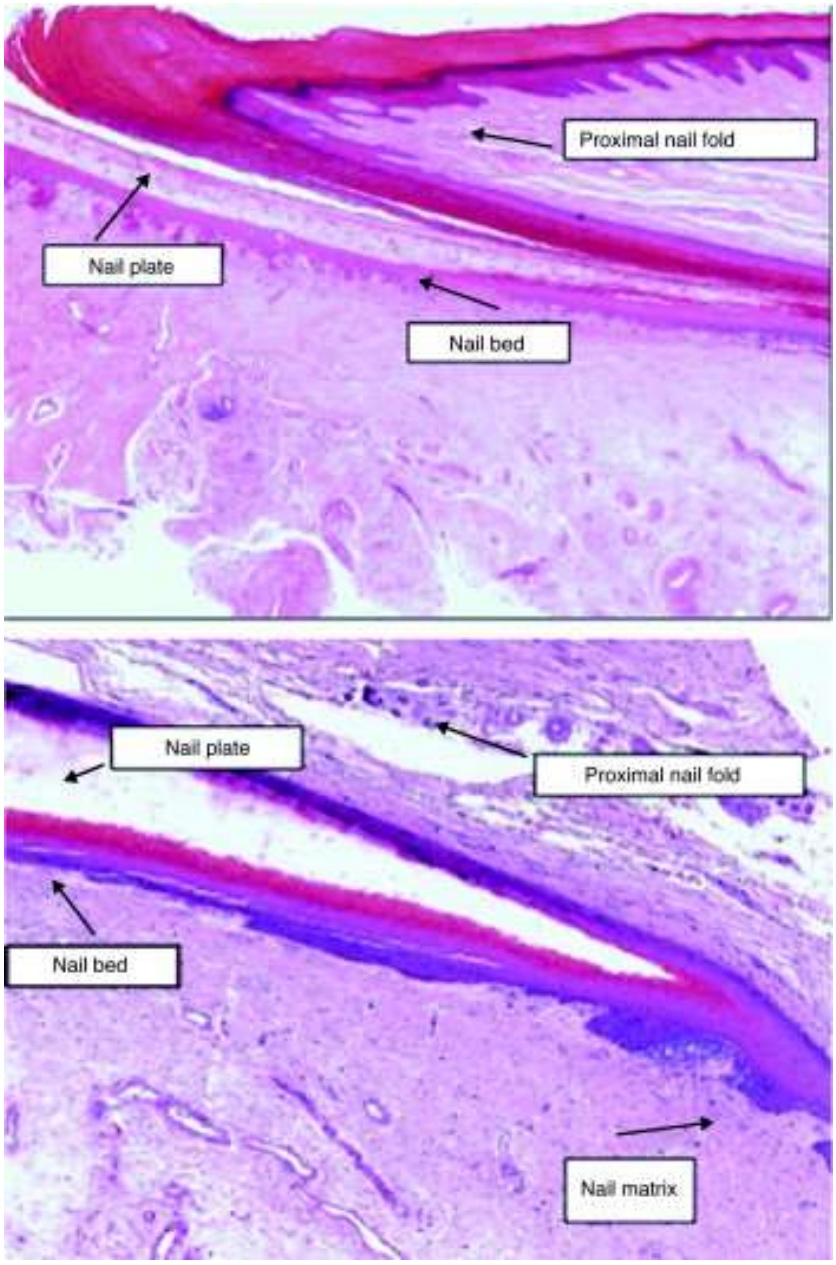


Figure 5: Normal histology of nail components

In fusiform biopsies, the nail bed and matrix are aligned longitudinally and transversely, respectively. The fragility of the matrix makes it impossible to handle with the utmost care during biopsies or suturing.[9]

This method guarantees that no residue of the matrix is left behind and keeps the lateral nail fold intact. It is possible to track the development of nail illness using this biopsy method since nails grow over the course of many months.[9]

In order to rule out subungual melanoma, it is crucial to take a biopsy of any pigmented streaks on the nails. In order to identify melanoma and avoid post-operative nail degeneration, a specific approach was designed to obtain a sufficient superficial nail matrix sample. To reveal the fragile proximal nail, the incision is made in the proximal nail fold and then drawn back. The pigmented matrix lies under the soft nail, which is exposed after cutting and elevating it. A little sample of the matrix's pigmented tissue is taken and submitted for analysis. A stitch or strips of suture are used to replace and seal the nail plate and proximal nail fold.[9]

Chronic kidney disease

Introduction

"Chronic kidney disease (CKD) is characterized by the presence of kidney damage or an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73 m², persisting for 3 months or more, irrespective of the cause".[4] I

The GFR-based CKD classification from 2012 (KDIGO) suggests identifying the etiology of CKD and divides the disease into six groups (G1–G5, with G3 divided into 3a and 3b). Furthermore, incorporates albuminuria staging at three levels (A1, A2, and A3), with each CKD stages further subdivided based early morning "spot" urine sample.[10]

Stages 1–5 of chronic kidney disease (CKD) are outlined below, with stage 3 broken down as 3A and 3B:

- "G1: GFR 90 mL/min/1.73 m^2 and above with evidence of kidney disease, such as hematuria or proteinuria"
- "G2: GFR 60 to 89 mL/min/1.73 m^2"
- "G3a: GFR 45 to 59 mL/min/1.73 m^2"
- "G3b: GFR 30 to 44 mL/min/1.73 m^2"
- "G4: GFR 15 to 29 mL/min/1.73 m^2"
- "G5: GFR less than 15 mL/min/1.73 m^2 or treatment by dialysis"

One of the three degrees of albuminuria is an ACR:

- "A1: ACR less than 30 mg/g (<3.4 mg/mmol)"
- "A2: ACR 30 to 299 mg/g (3.4-34 mg/mmol)"

- "A3: ACR greater than 300 mg/g (>34 mg/mmol)"

Decreased kidney function and increased albuminuria are prognostic signs that have benefited from the new CKD categorization. Overdiagnosis of chronic kidney disease (CKD), especially in the elderly, is a possible drawback of this categorization scheme.

Etiology

The principal causes of chronic kidney disease (CKD) and, eventually, end-stage renal disease (ESRD), which may occur anywhere in the world, include:[11]

- "Type 2 diabetes (30%-50%)"
- "Type 1 diabetes (3.9%)"
- "Hypertension (27.2%)"
- "Primary glomerulonephritis (8.2%)"
- "Chronic tubulointerstitial nephritis (3.6%)"
- "Hereditary or cystic diseases (3.1%)"
- "Secondary glomerulonephritis or vasculitis (2.1%)"
- "Plasma cell dyscrasias or neoplasm (2.1%)"
- "Sickle cell nephropathy, which accounts for less than 1% of ESRD patients in the United States."

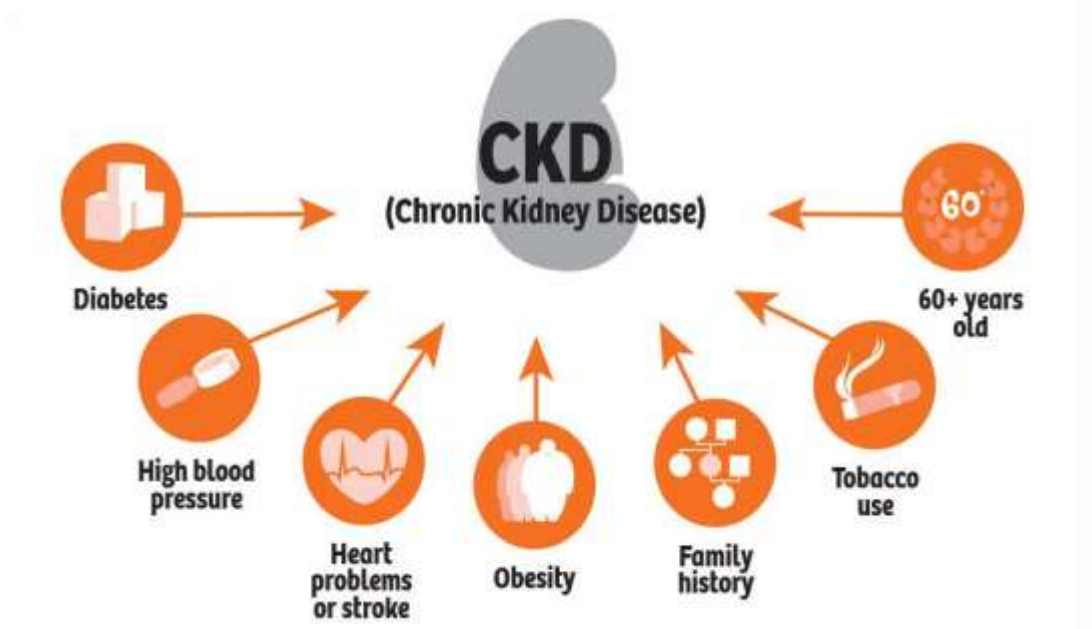


Figure 6: Chronic kidney disease – aetiology

Prerenal Disease

Acute tubular necrosis and other forms of intrinsic kidney damage are more likely to develop in individuals with chronic prerenal illness due to chronically reduced renal perfusion, which happens in those with chronic heart failure or cirrhosis. This may cause a gradual decline in renal function over time.

Intrinsic Renal Disease

Nephrosclerosis is prevalent, and it damages the tubulointerstitium, glomeruli, and blood vessels over time. Ischemic nephropathy may develop over the course of months or years caused by atherosclerosis or fibromuscular dysplasia, two other renal vascular disorders. Glandular and tubulointerstitial dysfunction are hallmarks of this disease.[12]

Intrinsic glomerular disease (nephritic or nephrotic): , Aberrant urine microscopy will reveal casts of red blood cells (RBCs), dysmorphicredcells (DSCs), and sometimes leukocytes, as well as varying degrees of proteinuria.[13] "Lupus nephritis, Goodpasture syndrome, vasculitis, infective endocarditis, post-infectious glomerulonephritis, IgA nephropathy, and infectious endocarditis are the most prevalent causes".[14]

Proteinuria, often exceeding 3.5 g/24 h, and a lack of activity, as shown by microscopic examination of the urine, with few cells or casts, characterize a nephrotic pattern. Among the most common causes include amyloidosis, diabetic nephropathy, FSGS, MGN, and minimal change disease.

In younger patients, other causes may include nephrocalcinosis (caused by high calcium levels in the blood and urine), sarcoidosis, Sjögren syndrome, and reflux nephropathy.[15]

Chronic interstitial nephritis (CIPN) or MesoAmerican nephropathy is a reasonably common form of kidney disease (CKD) among agricultural communities and is thought to have an unknown origin among agricultural laborers from Southeast Asia and Central America.

Postrenal (Obstructive Nephropathy)

The ureters may become permanently blocked due to prostatic illness, nephrolithiasis, or a tumour in the abdomen or pelvis that presses on them. It is also common for

congenital anomalies to cause blockage at the ureteropelvic or ureterovesical junctions. Retroperitoneal fibrosis and neurogenic bladder are two uncommon reasons for prolonged ureteral blockage.[16,17]

Epidemiology

Because early to intermediate stages of CKD are asymptomatic, it is tough to assess the real incidence and prevalence. [18]

Typical course and development of the disease

Patients referred to nephrology services usually have a distinct natural history and development of CKD . elder people are more prone to develop chronic kidney disease (CKD) in the community because they have long been exposed to risk causes for heart disease, hypertension , and high glucose levels , all of which may have an effect on renal function. After the age of 40 to 50, the typical rate of glomerular filtration rate reduction in the present group is about 0.75 to 1 mL/min/year.[19] While 20% of patients with stage 4 CKD needed renal replacement treatment, just 1% of cases who are in stage 3 CKD needed it, according to the research.. Cardiovascular disease (CVD) was the leading cause of death for 24% of patients in stage 3 and 45% of patients in stage 4, indicating that cardiac events, not end-stage renal disease , are the most common results in social based chronic kidney disease (CKD).[20]

Patients with referred CKD typically exhibit earlier onset of kidney damage and function loss compared to those with community CKD. This is because referred CKD is typically caused by hereditary conditions . The unique disease process determines the pace of progression in referral chronic kidney disease. The glomerular filtration rate (GFR) drops sharply on average by around 10 mL/min/year, in diabetic nephropathy. People with chronic proteinuric glomerulonephritis tend to have nondiabetic nephropathies that advance more quickly than individuals with lower proteinuria levels. It is possible for patients with ADPKD and chronic kidney disease (CKD) stage G3b or above to advance more rapidly than those with other nephropathies. Very slow progression is linked with hypertensive nephrosclerosis in individuals with little proteinuria and well-controlled blood pressure.

Risk Factors for Progression of Chronic Kidney Disease

It has been shown that across different kidney disorders, there are genetic variables that influence the course of CKD. Diabetes nephropathy and chronic kidney disease development were linked to TCF7L2 and MTHFS single nucleotide polymorphisms, according to population-based cohort research. Additionally, the same research demonstrated that CKD development is influenced by genes related to renal scarring .[21]

Modifiable CKD risk factors: Metabolic variables, proteinuria, and systemic hypertension are among them.[22]

Some researchers assume that glomerulosclerosis advances due to the transfer [23] There's a stronger correlation between ambulatory hypertension monitoring (ABPM) and CKD development than with routine measures. ABPM includes both nighttime and 24-hour blood pressure readings. In instance, systolic blood pressure is linked to CKD consequences and is an important predictor of CKD development.

Significant proteinuria, also known as albuminuria A3, has been associated with an accelerated rate of chronic kidney disease (CKD) development in both diabetic and nondiabetic renal disorders, according to many studies. Renal outcomes are improved when severe proteinuria is reduced by dietary changes or RAS inhibition. Although albuminuria was significantly reduced, large intervention studies like ACCOMPLISH and ONTARGET found significant reductions in glomerular filtration rate (GFR).[24,25] Hence, albuminuria (A2) at moderate levels does not suffice as a surrogate marker for the advancement of chronic kidney disease (CKD). Several studies have connected the RAAS system to the progression of chronic kidney disease (CKD) symptoms such as hypertension, proteinuria, and renal fibrosis. As a result, RAAS blockers are often used to manage proteinuria and diabetic renal disorders because therapies targeting the RAAS effectively reduce the course of CKD. Research has linked smoking and obesity to the onset and advancement of chronic kidney disease (CKD). Insulin resistance, dyslipidaemia, and hyperuricemia are metabolic variables that have also been linked to chronic kidney disease (CKD) onset and progression.[26,27]

Recommendations for Chronic Kidney Disease Screening

All throughout the globe, people are being screened, with the main focus being on those who are at high risk. People over the age of 65, those with hypertension or diabetes mellitus, and those with other high-risk conditions are all encouraged to undergo screening according to the KDOQI standards. Urinalysis, measuring should all be part of the screening process. No data exist at this time to back the practice of screening the asymptomatic.

Pathophysiology

Scarring and fibrosis are the result of a series of interconnected, multi-stage processes:

• The myofibroblast and fibroblast cell lines, which produce the extracellular matrix, are activated and proliferate.

• The usual architecture is replaced by the deposition of extracellular matrix.

Processes that contribute to the rapid worsening of chronic kidney disease

- "Systemic and intraglomerular hypertension"
- "Glomerular hypertrophy"
- "Intrarenal precipitation of calcium phosphate"
- "Altered prostanoid metabolism"

The end result of all these processes is glomerulosclerosis, a histological entity.[28]

Hyperglycemia, proteinuria, hypertension, and Black race are clinical risk factors for the rapid development of chronic kidney disease. Lead, smoking, metabolic syndrome, certain analgesics, obesity, and other environmental exposures have also been associated to a faster course of chronic kidney disease.[29]

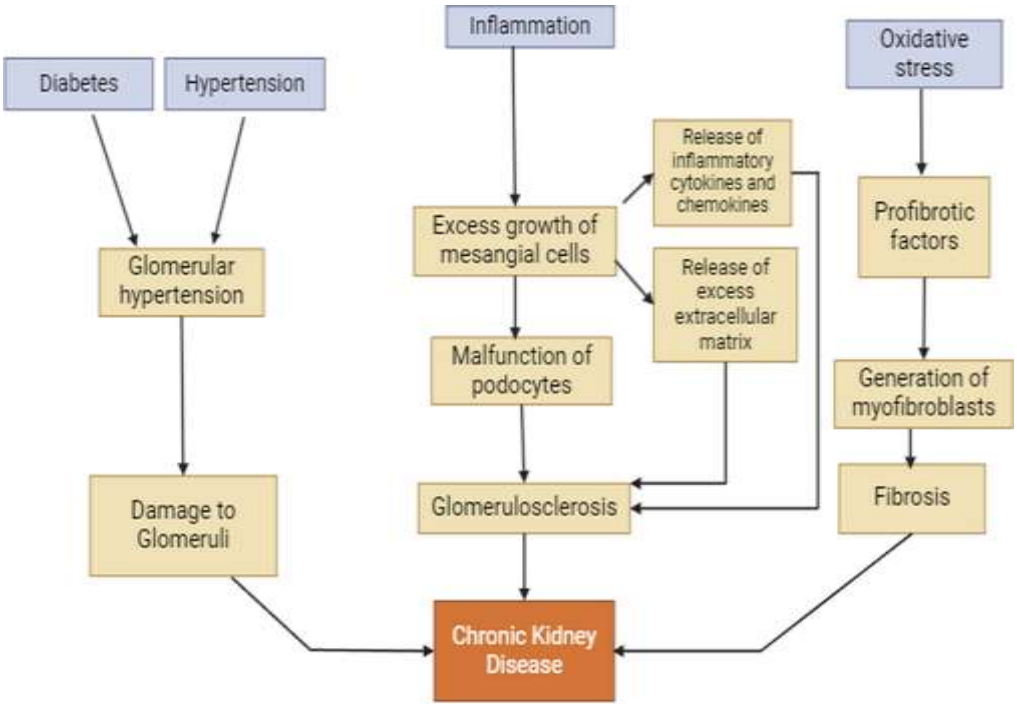


Figure 7: Pathophysiology of CKD

History and Physical

In the early stages of CKD, there are no symptoms. Symptoms become apparent during stage iv or v. "Some common symptoms and signs at these stages of CKD include":

- "Nausea"
- "Vomiting"
- "Loss of appetite"
- "Fatigue and weakness"
- "Sleep disturbance"
- "Oliguria"
- "Decreased mental sharpness"
- "Muscle cramps"
- "Swelling of feet and ankles"
- "Persistent pruritus"
- "Chest pain due to uremic pericarditis"

- "Shortness of breath due to pulmonary edema from fluid overload"
- "Hypertension"

A systemic examination may not be particularly informative, but patients might exhibit the following symptoms

- Alterations in "skin pigmentation"
- Excoriations resulting from scratching.
- Pericardial friction rub associated with uremic inflammation of cardiac wall.
- Uremic frost, characterized by the crystallization of urea from sweat into a fine, white powder on the skin due to elevated blood urea nitrogen levels
- Hyperreflexia or muscle fasciculations
- Hypertensive retinopathy indicative of chronic hypertension

Evaluation

Establishing Chronicity

In cases where a patient's estimated glomerular filtration rate (eGFR) falls below 60 mL/min/1.73m2, a thorough review of prior hematological and urine analyses, in conjunction with the patient's clinical background, is essential to differentiate between acute kidney injury and previously unrecognized chronic kidney disease. Several elements can aid in this differential diagnosis.

- Patients experiencing a sudden onset of AKI typically exhibit symptoms at comparable BUN/creatinine levels to those with CKD.

Assessment of Glomerular Filtration Rate

Patients in whom the difference between AKI and CKD is not evident should have their kidney function tests redone within two weeks of the first discovery of reduced eGFR. Measuring inulin clearance is considered the gold standard for determining creatinine. Nevertheless, since this is not easily accessible, the creatinine clearance is used as a substitute for determining the GFR.

Researchers are exploring various compounds as potential markers for detecting acute kidney disease and chronic kidney disease (CKD). These include "cystatin C, KIM-1, NGAL, beta-2 microglobulin, fibroblast growth factor 23 (FGF23)", and several

others. These biomarkers help assess kidney function and damage, aiding in early diagnosis and treatment.[30]

Assessment of Proteinuria

Getting a urine sample first thing in the morning and measuring the ACR is how proteinuria should be assessed, according to the KDIGO recommendations. Instead of words like microalbuminuria. In a healthy person's urine, you may find hundreds of different proteins. Uromodulin (the Tamm-Horsfall protein) accounts for about half of the total protein, followed by albumin (20%) and immunoglobulins (5%). Many techniques for characterisation and quantification have potential, including chromatography, immunoassays, fluorescence spectroscopy, infrared spectroscopy, and Raman spectroscopy. The most efficient and cost-effective approaches are protein-specific immunochemical and dipstick assays. Common proteinuric disorders cause albuminuria to be raised relative to other urine proteins; yet, the most popular protein section of urine dipsticks only measures albumin, which may not be able to assess other elevated amounts of urine proteins such Bence Jones proteins.[31–33]

The KDIGO recommendations recommend estimating as a backup plan in the absence of more precise proteinuria measurements: For albuminuria levels of 30–299 mg/g and above 300 mg/g, respectively, a protein dipstick result of "trace to +" or "+ or greater" may be used.

Imaging of Kidneys

Additionally, this might be useful in identifying ADPKD cystic expansion and persistent hydronephrosis caused by obstructive uropathy. If you think you could have renal artery stenosis, a renal ultrasonography with Doppler flow might help you figure it out.

Additional imaging of the kidney's size, echogenicity, collecting duct system, and potential blockage may be achieved by computerized tomography. In cases of renal artery stenosis or systemic vasculitis, renal angiography may help diagnose the condition by identifying the narrowing of the renal arteries and the presence of numerous aneurysms. If you believe persistent vesicourethral reflux is causing chronic kidney disease (CKD), voiding cystourethrography may confirm the diagnosis and give you an idea of how bad the reflux is.

Scans of the kidneys may provide all the details needed to understand their structure and function. Since they are linked to lower radiation exposure than CT scans, they are mostly utilized in youngsters. Variations in kidney function may also be measured using radionuclide renal imaging.

Establishing an Accurate Diagnosis

When there is a curable underlying disorder that needs specialized therapy, such ANCA vasculitis or lupus nephritis, a correct diagnosis of chronic kidney disease (CKD) is very important. The most reliable way to find out how much fibrosis has developed in the kidneys and what's causing chronic kidney disease is to do a kidney biopsy.

Treatment / Management

General Management

• A patient's eGFR readings should inform the adjustment of drug doses.

• Surgical referrals for hemodialysis or peritoneal dialysis access placement, as well as transplantation, should be made in preparation for renal replacement treatment.

Treatment of Reversible Causes of Renal Failure

Finding and treating infections, medications, hypotension, and hypovolemia—all of which can lead to AKI—is of utmost importance. Prior to undergoing intravenous contrast studies, patients with chronic kidney disease should undergo a thorough evaluation, and other options should be explored. It is also important to stay away from nephrotoxic agents like NSAIDs and aminoglycoside antibiotics.

Slowing the Progression of Chronic Kidney Disease

If at all feasible, keep proteinuria below 1 g/d while treating hypertension in accordance with the specified blood pressure targets.[34]

Smoking increases the likelihood of developing nephrosclerosis, and stopping slows the course of chronic kidney disease (CKD), according to many studies.[35] Decreasing intake of protein also slows the course of CKD. The advice of a dietitian is essential, nevertheless, since patients with severe CKD run the danger of malnutrition.

There is evidence that using bicarbonate supplements to treat chronic metabolic acidosis may slow the course of chronic kidney disease.[36] Furthermore, diabetics

whose blood sugar levels are well controlled are less likely to have albuminuria and less likely to get proteinuria as a result.[37]

Preparation and Initiation of Renal Replacement Therapy

Several choices for renal replacement treatment should be provided to patients after stage 4 CKD development is detected, as indicated below.

- This treatment option is highly recommended for end-stage renal disease (ESRD) because of its excellent long-term results.
- Conservative and palliative care management advice should be given to patients who opt out of renal replacement treatment.
- The nondominant arm must first have stable vascular access before hemodialysis may be conducted. If you value the veins in this arm, you should refrain from inserting intravenous cannulas. An AV fistula is the vascular access of choice. Tunnelled hemodialysis catheters and AV grafts are two more alternatives for hemodialysis access. Because of its low infection rates and high patency rates, AV fistulas are the favored choice. In addition to reducing the likelihood of recirculation, they permit increased blood flow rates.
- The insertion of a peritoneal catheter is the first step in peritoneal dialysis.[38]

Criteria for stating kidney replacement treatment

- "Pericarditis or pleuritis (emergent indication)."
- "Progressive uremic encephalopathy or neuropathy, with signs such as confusion, asterixis, myoclonus, and seizures (emergent indication)."
- "Hypertension is poorly responsive to antihypertensive medications."
- "Fluid overload refractory to diuretics."
- "Metabolic disorders that are refractory to medical therapy, such as hyperkalemia, hyponatremia, metabolic acidosis, hypercalcemia, hypocalcemia, and hyperphosphatemia."
- "Persistent nausea and vomiting."
- "Evidence of malnutrition."
- "Any other uremic sign or symptom."

Renal transplant assessment is usually possible for CKD patients when the "eGFR" drops 'below 20 mL/min/1.73 m²'. Referral to a transplant facility might be explored at an earlier stage if the patient has a live donor who could potentially donate a kidney. When patients opt out of renal replacement treatment, they still have the option of conservatively managing end-stage renal disease (ESRD). This method incorporates the following: adequate palliative care, advance care planning, and symptom control. It is worth considering this method, especially for patients who are weak and have low functional status, since it is commonly underused.

When to Refer to a Nephrologist

If they have any urine anomalies, they should be sent to a nephrologist. Optimal treatment is achieved with an early referral. When the estimated glomerular filtration rate (eGFR) drops below 20 mL/min/1.73 m², the patient should begin renal replacement treatment, which involves inserting the peritoneadialysiscatheter, creating vascular access for "haemodialysis", and being referred to a kidney transplant.

Differential Diagnosis

Consideration of alternative diagnosis should be given to patients presenting with symptoms and clinical findings that are similar to those of chronic kidney disease (CKD). Among the possible diagnosis are:

- "Acute kidney injury"
- "Alport syndrome"
- "Antigiomerular basement membrane disease"
- "Diabetic nephropathy"
- "Multiple myeloma"
- "Nephrolithiasis"
- "Rapidly progressive glomerulonephritis"
- "Renal artery stenosis"

Staging

There are six distinct ways to classify chronic kidney disease:

- "G1: GFR 90 mL/min/1.73 m^2 and above with urinary abnormalities suggesting kidney disease such as hematuria or proteinuria"
- "G2: GFR 60 to 89 mL/min/1.73 m^2"

- "G3a: GFR 45 to 59 mL/min/1.73 m^2"
- "G3b: GFR 30 to 44 mL/min/1.73 m^2"
- "G4: GFR 15 to 29 mL/min/1.73 m^2"
- "G5: GFR less than 15 mL/min/1.73 m^2 or ESRD"

Albuminuria categorizes into three levels:

- "A1: ACR less than 30 mg/g (<3.4 mg/mmol)"
- "A2: ACR 30 to 299 mg/g (3.4-34 mg/mmol)"
- "A3: ACR greater than 300 mg/g (>34 mg/mmol)"

Prognosis

An observational research known as the CRIC project is now in its fifth and final phase, having started in 2001. Just over 5,500 individuals participated in the CRIC trial, which looked at potential causes of chronic kidney disease and cardiovascular disease development. People with eGFRs ranging from 20 to 70 mL/min/1.73 m2 and a wide spectrum of renal disease severity were included in the research. The participants' ages ranged from 21 to 74. Diabetes was present in around 50% of the individuals. The main objectives of the study were kidney function measurements and the development of new or worsening CVD. These measurements have provided good data on many other important connections.[39,40]

Negative outcomes

Negative outcomes of Chronic Kidney Disease

Electrolyte and fluid regulation: Disturbances in elecrolyte and fluid are prevalent in chronic kidney disease (CKD), and they worsen in the stage 4 and 5. Sodium restriction and loop diuretics are a common treatment that helps these people. All individuals with chronic kidney disease should limit their salt consumption to less than 2 g/d, according to the 2012 KDIGO recommendations.

Hypertension: Although edema is not always present in CKD patient , high blood pressure with CKD might an indicator to volume expansion. Loop diuretics are helpful for many CKD patients before other antihypertensive dosage increases are considered. [41]

Although there are different recommendations, it is crucial to closely monitor your blood pressure and take readings at home on a regular basis in order to make the right medication adjustments and reach your objectives.

Hyperkalemia: Oliguric individuals and those with malfunction of the distal renal tubules are at increased risk of developing hyperkalemia in chronic kidney disease. Dietary potassium consumption, tissue breakdown, and resistance to aldosterone are variables that contribute.

Metabolic acidosis: The accumulation of acidic substances causes metabolic acidosis, a typical consequence of severe CKD. Osteopenia may develop in these individuals as a result of chronic metabolic acidosis. To keep the serum bicarbonate level at 23 mEq/L, bicarbonate supplementation is usually part of the treatment plan.

Hyperphosphatemia: As a result of a reduced filtered phosphorous load, hyperphosphatemia often develops as a consequence of chronic kidney disease. Secondary hyperparathyroidism results from an increase in PTH secretion. Hyperphosphatemia compromises bone health, despite hyperparathyroidism's best intentions to balance calcium and phosphorus levels. Beyond its impact on bone metabolism, the calcium and phosphorus metabolism protein FGF23 is also linked to cardiovascular mortality.

Anemia: Reductions in renal mass function, abnormalities in iron metabolism, and red blood cell survival lead to decreased erythropoietin synthesis, which in turn causes normocytic normochromic anemia in chronic kidney disease. Every year for patients in stage 3, every six months for those in the stage 4 and 5, and once in 30 days for those on renal replacement therapy, hemoglobin levels should be monitored. When ferritin levels are above 200 ng/mL, iron saturation is between 20% and 30%, and hemoglobin levels are below 10 g/dL, erythropoiesis-stimulating medications may be explored. A hemoglobin concentration of 10–11.5 g/dL is ideal for those undergoing dialysis.

Cardiovascular disease: Cardiovascular disease risk rises as CKD severity rises. Epicardial adipose tissue thickness is significantly associated with the occurrence of CVD events in CKD patients, according to substantial evidence. Consequently, examining epicardial adipose tissue may provide a dependable indicator of cardiovascular risk in individuals with chronic kidney disease.[42]

Insulin resistance: One of the main causes of atherosclerotic disease is chronic kidney disease (CKD), which is in turn caused by insulin resistance and metabolic syndrome. Higher levels of inflammatory markers are believed to moderate this relationship.

Management of end stage renal disease-related complications

Dietitians are vital in helping patients with chronic kidney disease (CKD) and end-stage renal disease (ESRD) improve their nutritional condition and general health. Impaired platelet function causes longer bleeding periods, which may lead to uremic hemorrhage as a consequence. Patients who do not have any symptoms usually do not need to be treated. But when bleeding is active or just before surgery, uremic platelet dysfunction must be corrected. Cryoprecipitate, estrogen, desmopressin (DDAVP), and the start of dialysis are all potential interventions.

Complications of Renal Transplantation

It is necessary to provide the proper prophylactic and immunizations to posttransplant patients due to the high prevalence of infectious problems. Heart failure, arrhythmias, coronary artery disease (CAD) from newly diagnosed diabetes mellitus, dyslipidaemia, and hypertension are other frequent consequences of chronic kidney disease. Neoplastic disease, infections of the central nervous system, neuromuscular and seizure diseases, infections of the posterior reversible encephalopathy syndrome, and stroke are all examples of neurological consequences. Infections, damaged mucosa, ulcers, perforations, pancreatitis, diverticular disease, biliary tract diseases, and gastrointestinal tract infections are all possible consequences. Patients undergoing kidney transplants are at a higher risk of developing cancers such skin cancer and posttransplant lymphoproliferative disease as a result of immunosuppression.[43–45]

ONYCHOSCOPIC NAIL CHANGES IN CHRONIC KIDNEY DISEASE:

- **Onycholysis**

Patients with chronic renal failure most often had onycholysis, a nail irregularity that may be caused by both systemic and localized alterations. Most finger injuries are the result of trauma, improper manicure techniques, or improper work or self-care. Psoriasis and pustular psoriasis are the most prevalent diseases that cause fingernail onycholysis. Pharmacological phototoxic dermatitis is another potential cause of finger onycholysis. As soon as there is a separation, the vegetation of the surrounding area begins to colonize the empty space. Women seem to have more cases of finger onycholysis. It is common practice to collect Candida albicans from the onycholytic space. There are a lot of claims that try to link yeast to finger onycholysis, but there isn't enough evidence to support this, and treating candida doesn't help.[46]

Figure : Finger onycholysis

- **Splinter haemorrhage**[47]

Small, longitudinally oriented, dark reddish-brown lines in the nail bed are the hallmark of splinter haemorrhages, a nonspecific alteration in the nail. They often manifest on the far end of the nail and cause no symptoms at all. The little quantities of blood in the nail bed's longitudinal grooves cause them. A classic symptom of splinter hemorrhages is linear discolouration, which develops when capillaries in the nail plate burst, causing extravasation. George Blumer first reported them in 1923 as "splinters under the nail" in patients with subacute bacterial endocarditis; hence, they are often taught in medical and residency programs.[48] However, they often appear further from the nail and are caused by trauma, such as biting one's nails or walking with a cane.[48] Spiter haemorrhages develop proximally and occur in several nails in systemic illnesses such bacterial endocarditis.

Figure: Splinter haemorrhage

- **Beau's lines**

According to research by Lee DK et.al., transverse depressions in one or more nails known as Beau's lines. [49] The proximal nail fold is the first site of observation for this abnormality, which is a result of nail matrix arrest. Due to the trauma of birth, Beau's lines may appear in newborns between 4 and 10 weeks old. Additionally, preterm births caused by intrauterine stress have been documented.[50]

Figure: Beau's lines

- **Koilonychia**

Originating from the Greek words "koilos" meaning "hollow" and "onikh" meaning "nail," the name "koilonychia" is used here. Nails that are spoon-shaped or concave are another name for this condition. The condition manifests as a thin, fragile, concave nail dystrophy that may be horizontally or vertically positioned, giving the impression of a centrally depressed and laterally everted finger or toenail plate. Babies, kids, and

grownups can all have it. It is critical to investigate further when a patient exhibits this symptom to rule out more significant health issues. Koilonychia can occasionally be a sign of inflammatory skin diseases like psoriasis or lichen planus. It can also be a result of systemic changes like diabetes mellitus or endocrine disorders like hypothyroidism or hyperthyroidism. Other possible causes include "trauma, occupational exposure to petroleum products, high altitude, vascular disorders, musculoskeletal disorders, genetic disorders, autoimmune disorders, alopecia areata, onychomycosis, alopecia areata, onychomycosis, vascular disorders, musculoskeletal disorders, genetic or autoimmune disorders", and so on.[51] Iron deficiency anaemia, inflammatory skin illness, and onychomycosis are the most prevalent settings when koilonychia is detected (6.4% of patients).

Figure: Koilonychia

- **Onychomycosis**

A fungal infection of the nail bed is known as onychomycosis. Onychomycosis caused by dermatophytes is known as tinea unguium.[52] Infections caused by dermatophytes, yeasts, and saprophytic molds are together known as onychomycosis. Dystrophic nails are aberrant in shape and size and are not caused by fungus. Although onychomycosis

may infect either fingernails or toenails, the toenail infection is far more common. In what follows, we'll go over every nuance of this ever-changing subject: toenail onychomycosis disease burden, clinical kinds, staging, diagnosis, and treatment.[53–55] Although other dermatophytes, such as Epidermophyton floccosum and Trichophyton mentagrophytes, may also cause onychomycosis, Onychomycosis in 90% of toenails and 50% of fingernails is caused by dermatophytes.[56] In 2% of instances of onychomycosis, particularly in fingernails, Candida albicans is the causative agent. Toenails are the most common culture medium for nondermatophytic mold onychomycosis. About 8% of nail infections are caused by saprophytic molds such as Fusarium, Aspergillus, Acremonium, Scytalidium, and Scopulariopsis brevicaulis.[57,58]

Figure: White superficial onychomycosis

- **Brittle nails**

Up to 20% of the population has nail plate brittleness or fragility; this condition is more frequent in women over the age of 50, and it is more often seen in fingernails than in toenails.[59] Cracking, flaking, and crumbling, as well as softening and losing

suppleness, are symptoms of nail brittleness. Both primary and secondary forms of nail fragility (NF) can be distinguished based on the factors that cause them. Secondary NF can be a result of other conditions as well. For the best results, it's best to address the root cause of brittle nails whenever feasible. It has been shown that some vitamins, trace minerals, and amino acids, particularly biotin (commonly known as vitamin B7), may be helpful in the treatment of idiopathic NF when taken orally. Also, to lessen the emotional toll of this prevalent issue, you may want to think about using topical moisturizers and lacquers to reshape the damaged nail plate.[60,61]

Figure: Brittle nails

- **Leukonychia**

According to research by Iorizzo et.al., a white staining of the nail is known as leukonychia. Possible causes of the white hue include irregularities in the nail bed or the nail plate.[62]

Types:

True leukonychia:

1. "Cryotherapy for the treatment of periungual warts,"
2. "Traumatic event of proximal nail fold."
3. "Reflex sympathetic dystrophy, epilepsy, Psoriasis, Alopecia areata, Renal transplant recipient."

Pseudo leukonychia:

1. “2-Ethyl-cyanoacrylate glue, Granulation”
2. “White superficial onychomycosis, Proximal subungual onychomycosis”

Figure: Pseudo leukonychia:

- **Longitudinal ridges**

Systemic amyloidosis, nail-patella syndrome, collagen vascular disorders, and graft versus host disease are all conditions that may cause fissures in the nails, however a single nail fracture is usually the result of a little impact.[63,64]

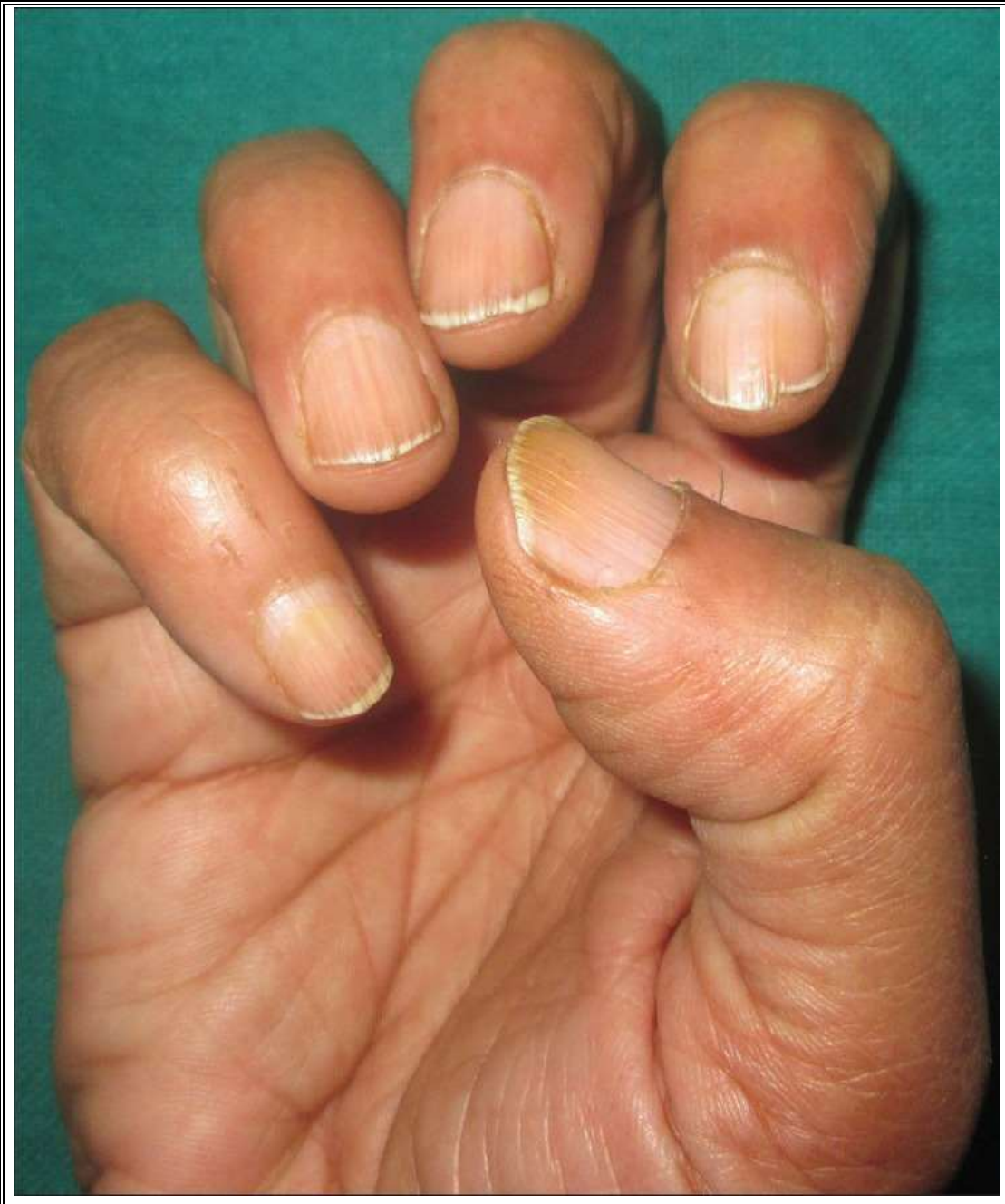


Figure: Longitudinal ridges

- **Subungual hyperkeratosis**

Deposition of cells under nail beds that did not undergo desquamation is the hallmark of subungual hyperkeratosis. In terms of known causes, psoriasis, onychomycosis, and HPV are at the top of the list. Very few instances of subungual hyperkeratosis in hemiplegic limbs have been documented; those that have were associated with psoriasis.[65]

Figure: Subungual hyperkeratosis

- **Paronychia**

Infection of the folds of the fingernails and toenails, as well as the tissue around the nail's base and sides, is known as paronychia. This disorder may develop on its own or as a result of external factors like trauma or manipulation. Of all the hand infections, paronychia is among the most frequent. In the case of paronychia, germs are introduced into the region when the protective barrier between the nail and the nail fold is disrupted, making it more susceptible to infection. Acute paronychia typically affects only one nail, although it may spread to several nails if caused by drugs.[66,67]

1) Quickly developing painful red swelling of the proximal and lateral nailfold, which may happen either naturally or as a result of manipulation, is known as acute paronychia.

s 

Figure: Acute paronychia

- **Pincer-nail deformity**

Frost first described pincer nail deformity (PND) in 1950 as "incurvated nail," but Cornelius and Shelley renamed it "pincer nail" in 1968.[68,69] More recent works tend to use the phrase pincer nail. It affects around 0.9% of the population and most often appears on the outside, interior, or both sides of hallux toenails; fingernails and other toenails are seldom impacted.[70] In proximal to distal fashion along the longitudinal axis of the nail plate, the distal end of the nail bed becomes thinner and thicker in PND, and the maximum transverse curvature increases, causing the margins of the nail to dip into the lateral fold. Patients' day-to-day lives are disrupted by the chronic inflammation, intense pain, and recurring infections caused by the increasing curvature along the distal edges of the nail. Some people with PND need to have their toes amputated because the condition makes it so difficult for them to walk or wear shoes.[71]

Figure: Pincer nail deformity

- **Muehrcke's lines**

According to research by Zaiac MN et.al, Muehrcke's lines are two white transverse bands that run parallel to the distal lunula and over the whole nailbed. In 1956, Dr. Robert Muehrcke published a description of Muehrcke's nails—also called Muehrcke's lines—in the British Medical Journal.[72] The results point to what seems to be a leukonychia, a white stain on the nail that goes away when you apply pressure while the nail stays transparent. Similar to other types of apparent leukonychia, Muehrcke's nails might be a sign of deeper systemic diseases.[73] Although this disease has been associated with hypoalbuminemia in a cohort of 65 individuals studied by Muehrcke in 1956, it has subsequently been connected to a variety of other causes.[74]

Figure: Muehrcke’s lines

- **Melanonychia**

Because melanin is present in the nail plate, a black-brown discoloration of the nail is called melanonychia. Melanonychia may develop for reasons such as benign or malignant melanocytic activation or melanocytic proliferation. The evaluation of melanonychia requires three steps: (1) confirming that the pigment is melanin; (2) identifying if matrix melanocyte activation or proliferation is responsible for the development of melanonychia; and (3) evaluating proliferation to ascertain the disease's benign or malignant nature.Click or tap here to enter text.

Figure: Melanonychia

- **Pitting of nail**

Nail pits may vary in shape and location, but they are always superficial depressions inside the nail plate. Pits form when the proximal nail matrix fails to adequately support the nail plate's outermost layer. Clusters of cells that do not normally keratinate in the stratum corneum prevent keratinization from occurring normally.[76]

Figure: Nail pitting

Chronic renal failure (CRF) is caused by a gradual, often slow, decline in renal excretory function, according to research by Aquil N et.al. Dialysis and kidney transplantation may be necessary when a patient's glomerular filtration rate drops below 10 or even 5 mL/min, compared to the usual range of 110 to 120 mL/min in healthy persons. Approximately 71.4% of uremic patients have nail problems; the most common alterations are a lack of a lunula, splinter hemorrhages, and half-nails.[77]

MATERIALS AND METHODS

MATERIALS AND METHODS

Source of data: This study was conducted in R L Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar from May 2023 to November 2024 in all patients diagnosed with chronic kidney disease.

Study design: Observational cross-sectional study.

Sample size calculation:

By taking the prevalence of Nail Disorders in patients with Chronic Renal Failure as 71.4% in a study by Aquil N et.al and 95% confidence level with 10% absolute precision the sample size achieved was 314.sample size was calculated based on opened epiversion 3.01.

$$\text{Sample size} = \frac{Z_{1-\alpha/2}{}^2 p(1-p)}{d^2}$$

Here

$Z_{1-\alpha/2}$ = Is standard normal variate (at 5% type 1 error ($P<0.05$) it is 1.96 and at 1% type 1 error ($P<0.01$) it is 2.58). As in majority of studies P values are considered significant below 0.05 hence 1.96 is used in formula.

p = Expected proportion in population based on previous studies or pilot studies.

d = Absolute error or precision – Has to be decided by researcher.

Inclusion criteria

All patients of both sexes of age 30 to 70 years with chronic kidney disease who are admitted in RL Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar was included in the study.

Exclusion criteria:

Patients and/or their guardians not giving consent for the participation in the study.

Methods of data collection:

Patients with chronic kidney disease attending the Department of Dermatology, Venereology and Leprosy in R L Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar diagnosed with Nail manifestations was evaluated based on a detailed clinical history including onset and evolution of lesion. A comprehensive medical history of the patient was recorded ,including their name ,age,sex the type and duration of the illness,and any contributing factors such as medication use,application of topical treatments or use of cosmetics. The cost for the required blood investigations was borne by the respective principal investigator.

STATISTICAL ANALYSIS

The data was collected using Microsoft 365 Excel and analyzed using SPSS v27.0. The normality test (Shapiro-Wilk Test) was performed to analyze the data, and the results were expressed as frequency with percentage and mean with standard deviation or median with interquartile range. Association between categorical variables was assessed using Chi-square test or Fisher's exact test. All the statistical analyses were carried out at a 5% level of significance, and results with the P value < 0.05 were considered statistically significant.

RESULTS

RESULTS

Table: Age distribution of the study population

Age	Frequency	Percentage
30 – 40	82	26.1
41 – 50	80	25.5
51 – 60	77	24.5
61 – 70	75	23.9
Total	314	100.0

This study comprised of individuals from 30 to 70 years. In this study majority of the subjects belonged to the age group of 30–40 years, with 82 individuals, or 26.1% of the total participants. This indicates that over twenty-five percent of the sample included the younger part of the adult population. In the 41–50 years age group there were 80 participants (25.5%). The age group of 51–60 years comprised 77 persons, accounting for 24.5% of the overall population. The group aged 61–70 years comprised 75 participants (23.9%), or approximately one-fourth of the overall sample. The mean age of the study population was 50.26 years ± 11.64 years.

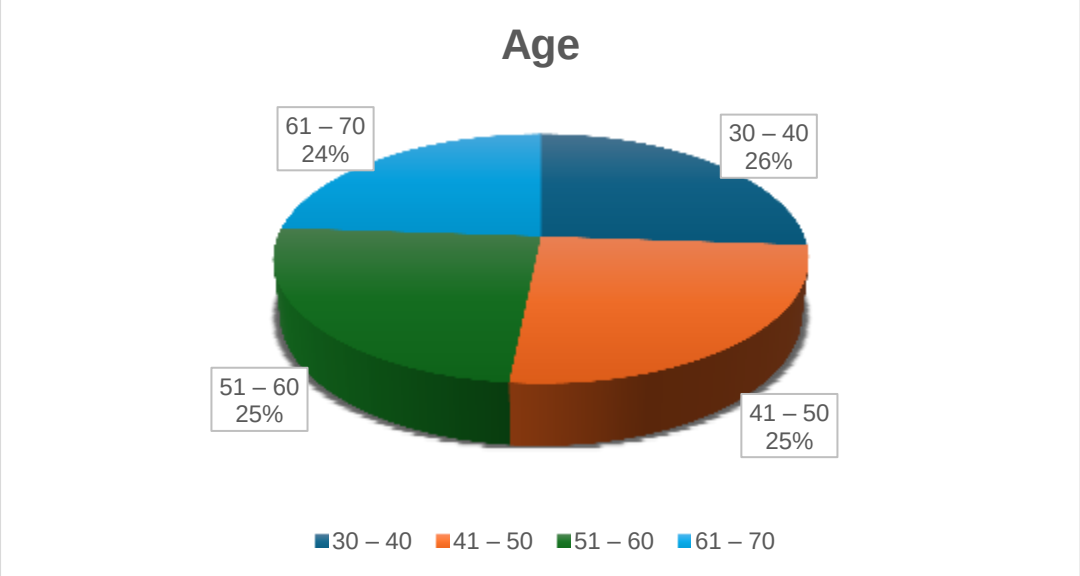


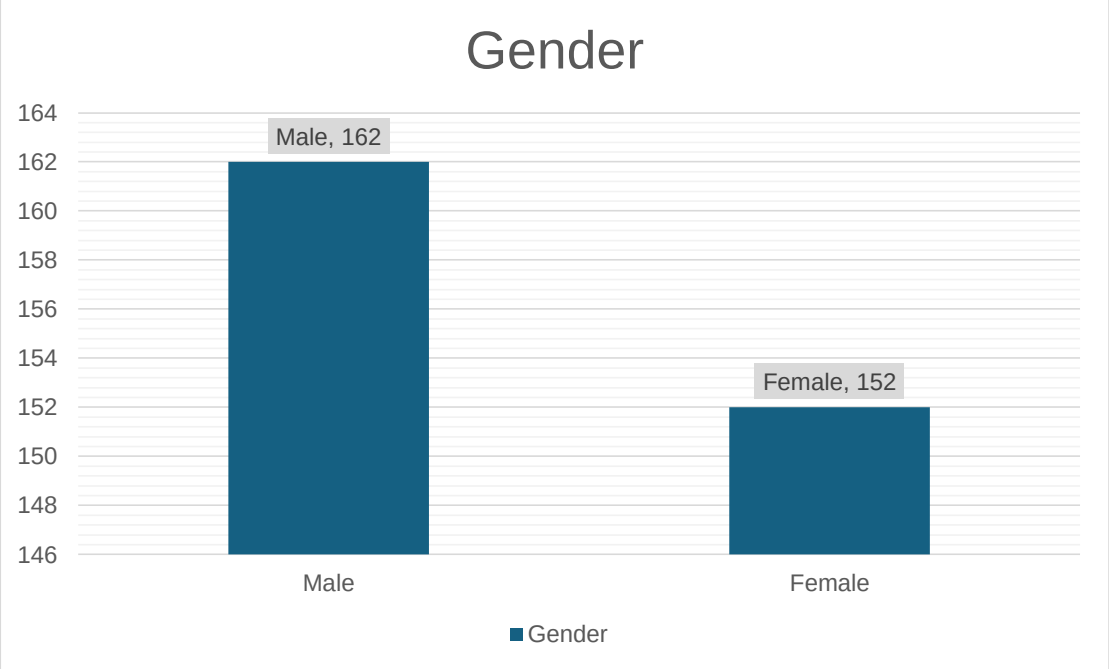
Figure: Graph representing age distribution of the study population

Table: Gender distribution of study participants

Gender	Frequency	Percentage
Male	162	51.6
Female	152	48.4
Total	314	100.0

In this study males were 162 (51.6%) in number, while females were about 152 (48.4%). Thus a small male majority was observed in this study.

Figure: Graph representing sex based distribution of study subjects



In this study we looked at the gross changes and onychoscopic changes in CKD. It was observed that onychoscopic and gross nail changes are similar. Hence the results of gross and onychoscopic observations will be displayed together as tables and bar diagrams as the values are same for both.

Table : Distribution of gross nail changes in the study population

Nail changes	**Frequency**	**Prevalence**
Onycholysis	94	29.9
Leukonychia	76	24.2
Splinter hemorrhage	75	23.9
Melanonychia	74	23.6
Longitudinal ridges	66	21
Paronychia	50	15.9
Subungual hyperkeratosis	43	13.7
koilonychia	41	13.1
Onychomycosis	40	12.7
Brittle nails	35	11.1
Absence of Lunula	29	9.2
Pitting of Nail	28	8.9
Beau’s lines	27	8.6
Pincer-nail deformity	21	6.7
Muehrcke’s lines	17	5.4

Figure: Graph representing distribution of gross nail changes in study population

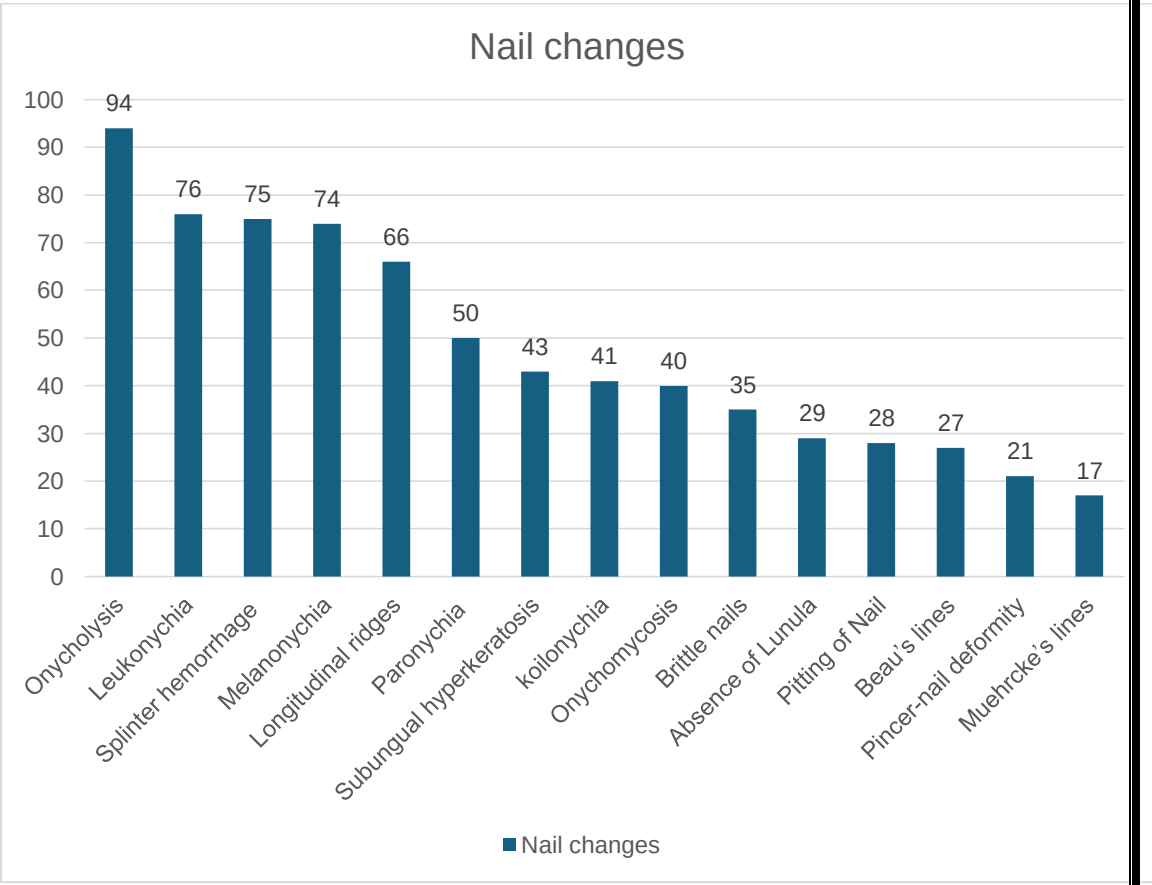


Table : Frequency distribution of onychoscopic changes

Onychoscopic changes	Frequency	Percentage
Present	260	82.8
Absent	54	17.2

In this study, onychoscopic changes were present in almost 82.8% of the study population

Figure: Graph representing distribution of onychoscopic changes

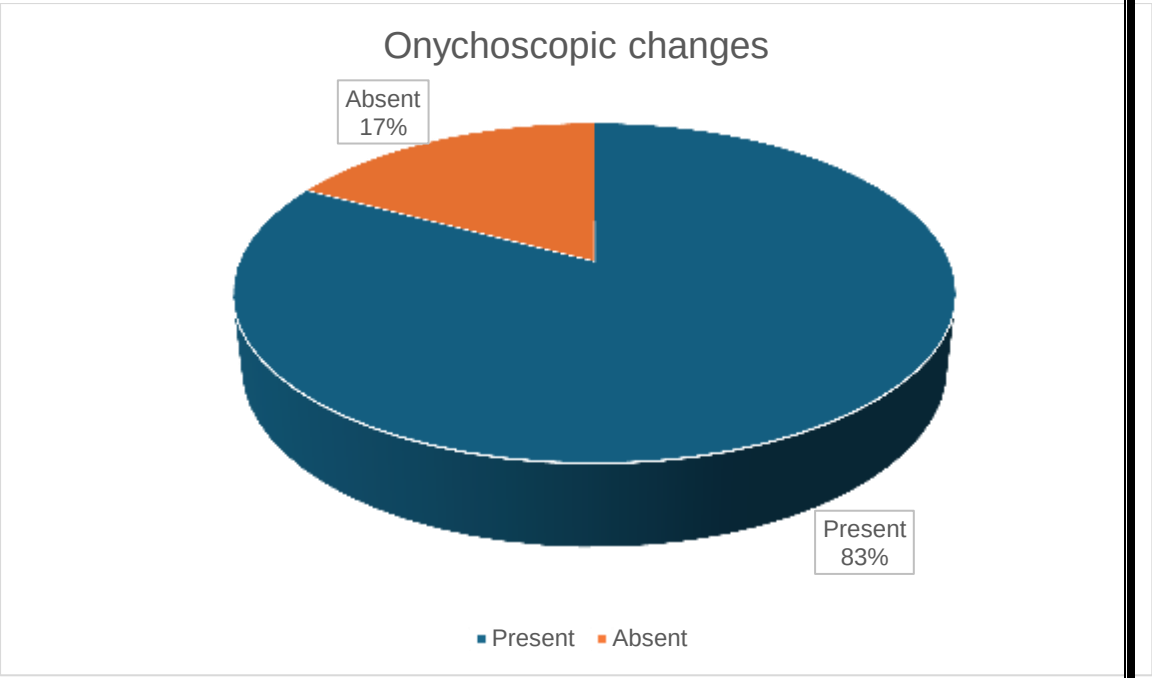


Table : Distribution of various onychoscopic nail changes in the study population

Nail changes	**Frequency**	**Percentage**
Onycholysis	94	29.9
Leukonychia	76	24.2
Splinter hemorrhage	75	23.9
Melanonychia	74	23.6
Longitudinal ridges	66	21
Paronychia	50	15.9
Subungual hyperkeratosis	43	13.7

Onychomycosis	40	12.7
Brittle nails	35	11.1
Absence of Lunula	29	9.2
Pitting of Nail	28	8.9
Beau's lines	27	8.6
Pincer-nail deformity	21	6.7
Muehrcke's lines	17	5.4

Figure: Graph representing distribution of onychoscopic nail changes in study population

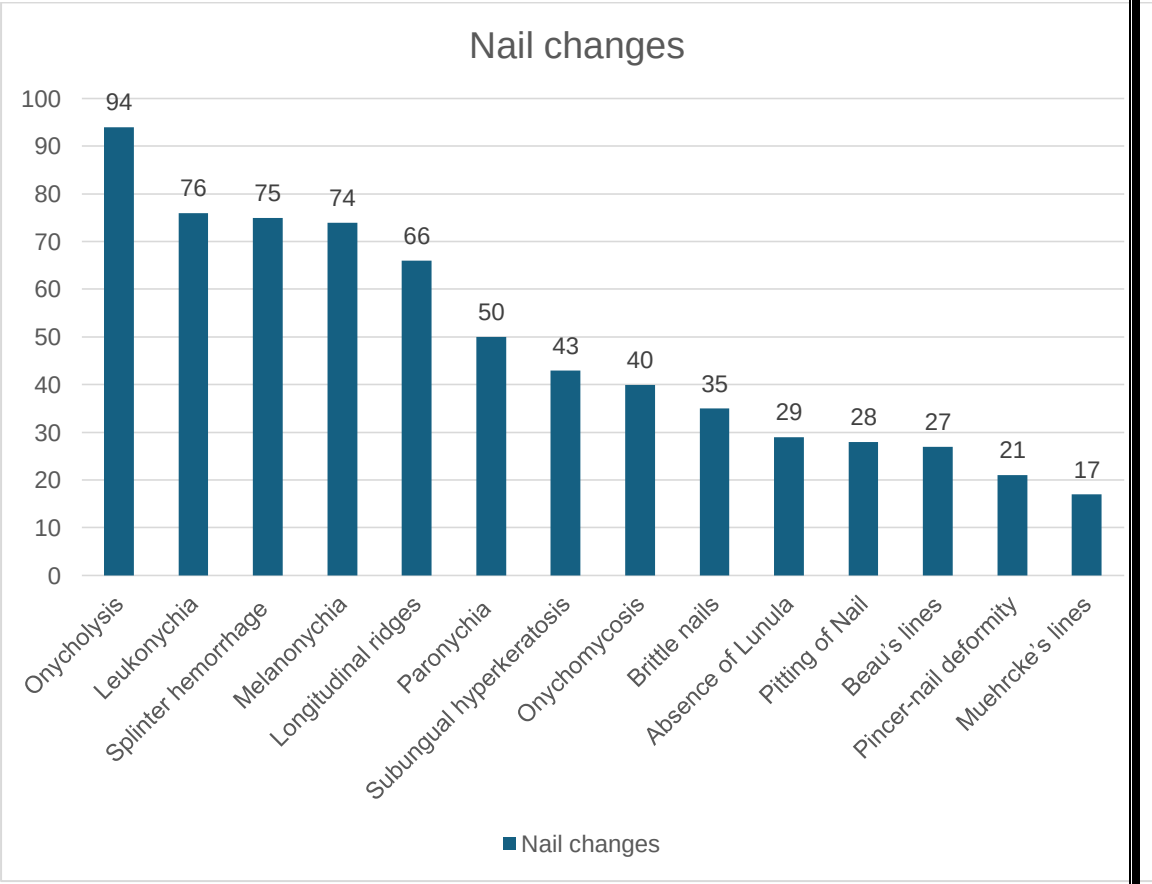


Table : Distribution of CKD stages in this study

CKD stages	Frequency	Percentage
Stage 1	105	33.4
Stage 2	109	34.7
Stage 3	53	16.9
Stage 4	29	9.2
Stage 5	18	5.7

In this study 105 (33.4%) of the study population belonged to CKD stage 1, 109 (34.7%) were in stage 2 of CKD and 53 (16.9%) were in stage 3 of CKD. Around 29 (9.2%) patients were in stage 4 and 18 (5.7%) were in stage 5 of CKD.

Figure: Graph representing distribution of CKD stages in this study

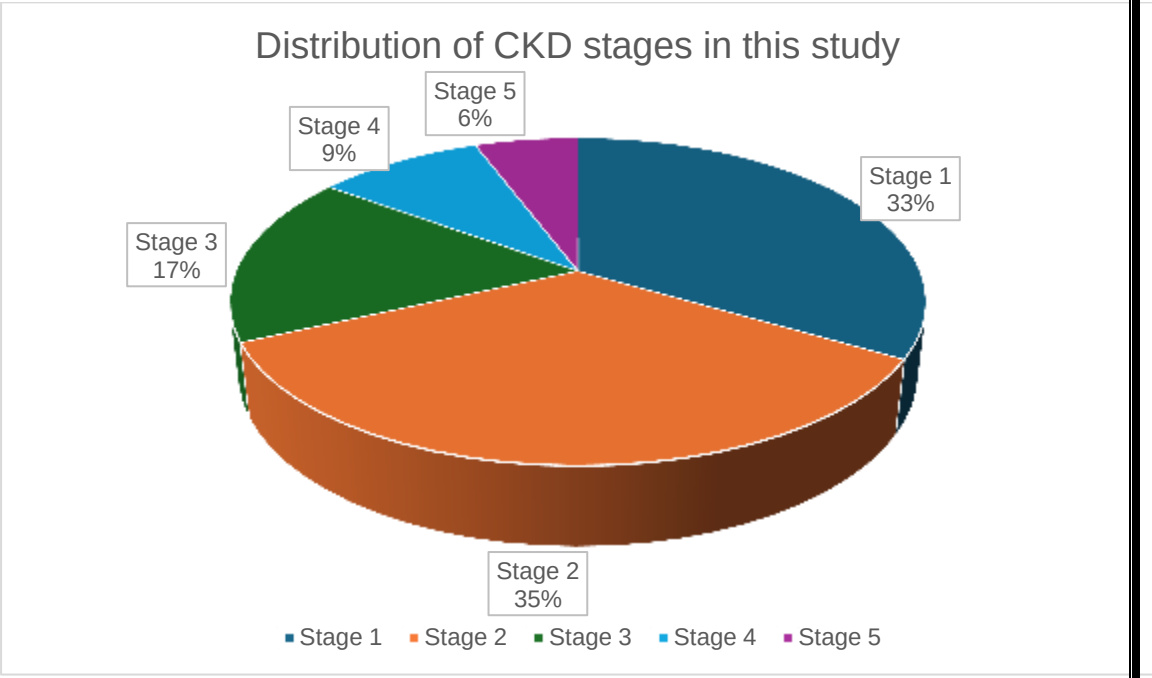


Table : Distribution of Nail changes in various stages of CKD

Nail changes	Stage 1 (%)	Stage 2 (%)	Stage 3 (%)	Stage 4 (%)	Stage 5 (%)
Splinter hemorrhage	47 (44.8)	20 (18.3)	3 (5.7)	2 (6.9)	3 (16.7)
Longitudinal ridges	26 (24.8)	19 (17.4)	12 (22.6)	6 (20.7)	3 (16.7)
Melanonychia	25 (23.8)	24 (22.0)	13 (24.5)	8 (27.6)	4 (22.2)
Onycholysis	24 (22.9)	31 (28.4)	22 (41.5)	10 (34.5)	7 (38.9)
Leukonychia	22 (21.0)	27 (24.8)	13 (24.5)	9 (31.0)	5 (27.8)
Subungual hyperkeratosis	16 (15.2)	13 (11.9)	7 (13.2)	4 (13.8)	3 (16.7)
Paronychia	15 (14.3)	22 (20.2)	9 (17.0)	2 (6.9)	2 (11.1)
koilonychia	14 (13.3)	16 (14.7)	7 (13.2)	2 (6.9)	2 (11.1)
Onychomycosis	14 (13.3)	15 (13.8)	5 (9.4)	2 (6.9)	4 (22.2)
Pincer-nail deformity	11 (10.5)	7 (6.4)	2 (3.8)	0 (0.0)	1 (5.6)
Pitting of Nail	11 (10.5)	9 (8.3)	3 (5.7)	2 (6.9)	3 (16.7)
Brittle nails	10 (9.5)	14 (12.8)	7 (13.2)	4 (13.8)	0 (0.0)
Beau's lines	9 (8.6)	12 (11.0)	2 (3.8)	3 (10.3)	1 (5.6)
Muehrcke's lines	6 (5.7)	5 (4.6)	4 (7.5)	1 (3.4)	1 (5.6)
Absence of Lunula	5 (4.8)	6 (5.5)	1 (1.9)	4 (13.8)	13 (72.2)

In the current study the most common nail changes identified among patients with stage 1 CKD was splinter haemorrhage (44.8%), followed by longitudinal ridges (24.8%), melanonychia (23.8%), onycholysis (22.9%) and leukonychia (21.0%). In those patients with Stage 2 CKD, the most common nail deformity identified was onycholysis (28.4%), closely followed by leukonychia (24.8%), melanonychia (22.0%) and paronychia (20.2%). The least common nail deformity found in stage 2 CKD was Muehrcke's lines (4.6%).

In patients with stage 3 CKD, the most common nail deformity identified was onycholysis (41.5%), closely followed by leukonychia (24.5%), melanonychia (24.5%) and longitudinal ridges (22.6%). The least common nail deformity that was observed in stage 3 CKD was absence of lunula (1.9%).

Stage 4 CKD was characterized by the following nail deformities – onycholysis in 34.5% of the cases, leukonychia in 31.0% of the cases, melanonychia in 27.6% of the cases and longitudinal ridges in 20.7% of the cases. The least common nail deformity found in stage 4 CKD was Muehrcke's lines (3.4%). Pincer nail deformity was found to be absent in stage 4 CKD cases.

The other common nail deformities observed in stage 5 CKD were, onycholysis (38.9%), leukonychia (27.8%), onychomycosis (22.2%) and melanonychia (22.2%). The least common nail deformity observed was Muehrcke's lines (5.6%), pincer nail deformity (5.6%) and Beau's lines (5.6%).

Figure: Graph representing distribution of nail changes in various stages of CKD

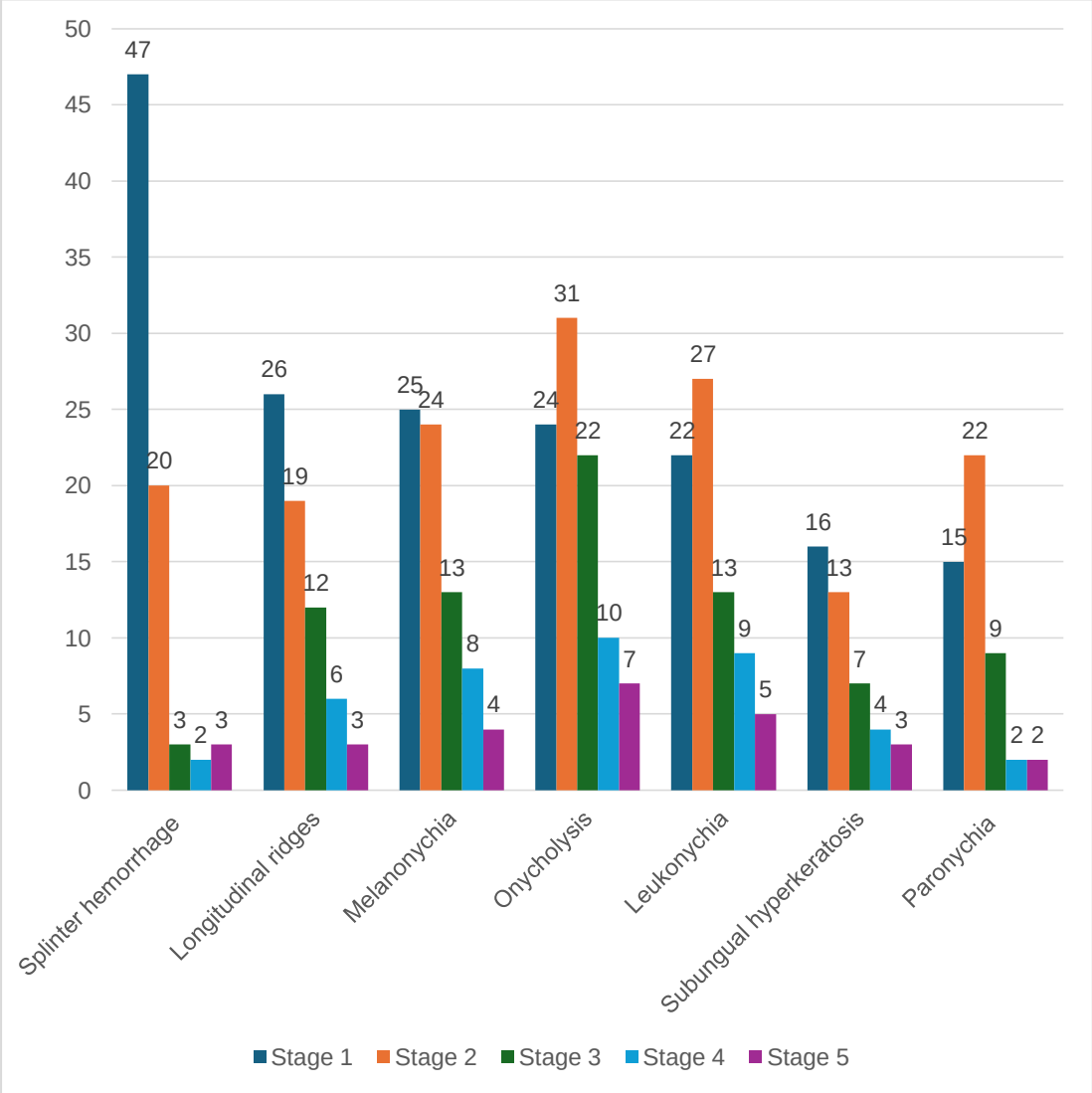
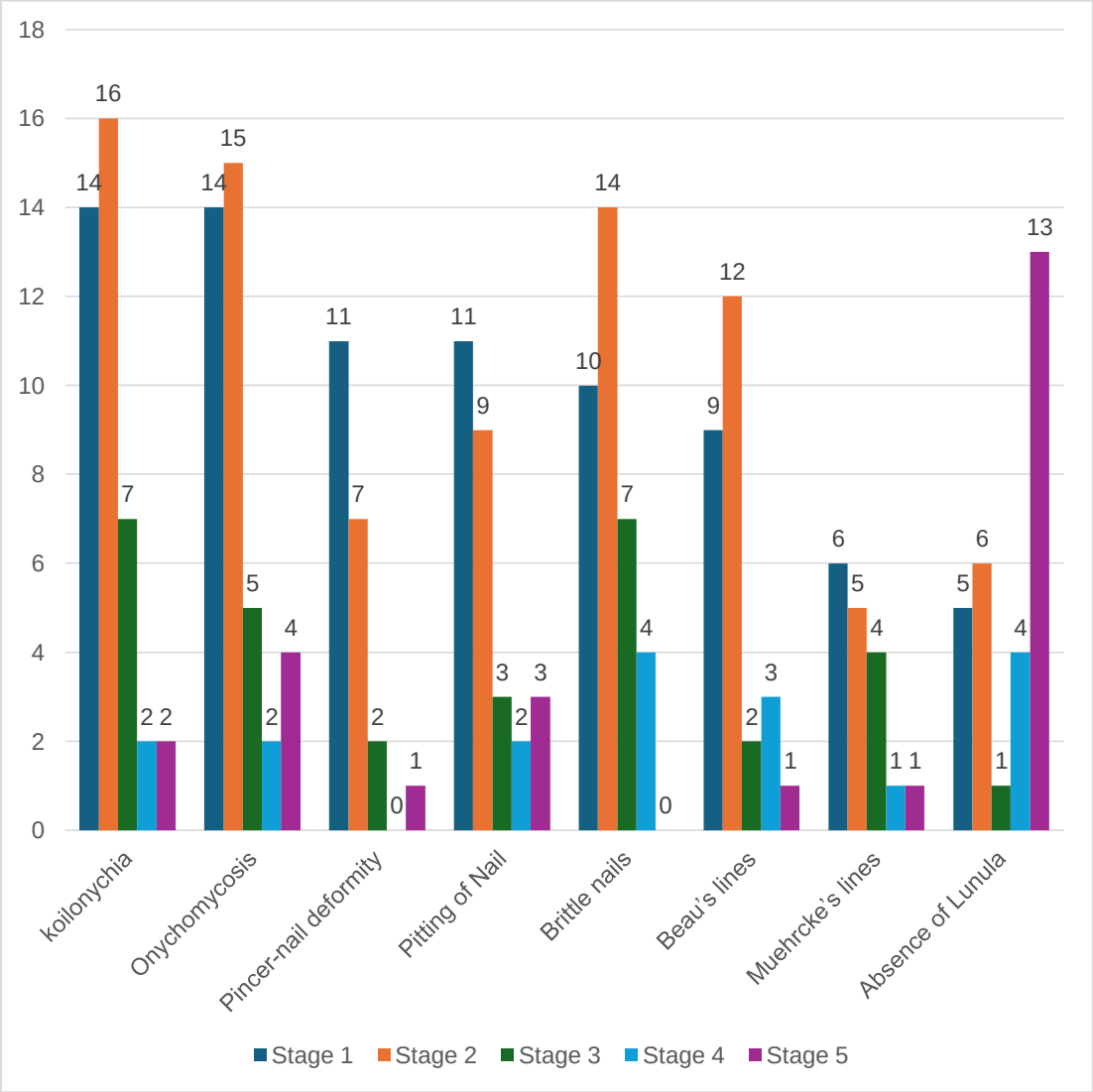


Figure: Graph representing distribution of nail changes in various stages of CKD 2



Onychoscopic pictures of various nail conditions

Figure 22: Splinter Hemorrhages

Figure 23: Ridges

Figure 24: Subungual hyperkeratosis and distal onycholysis

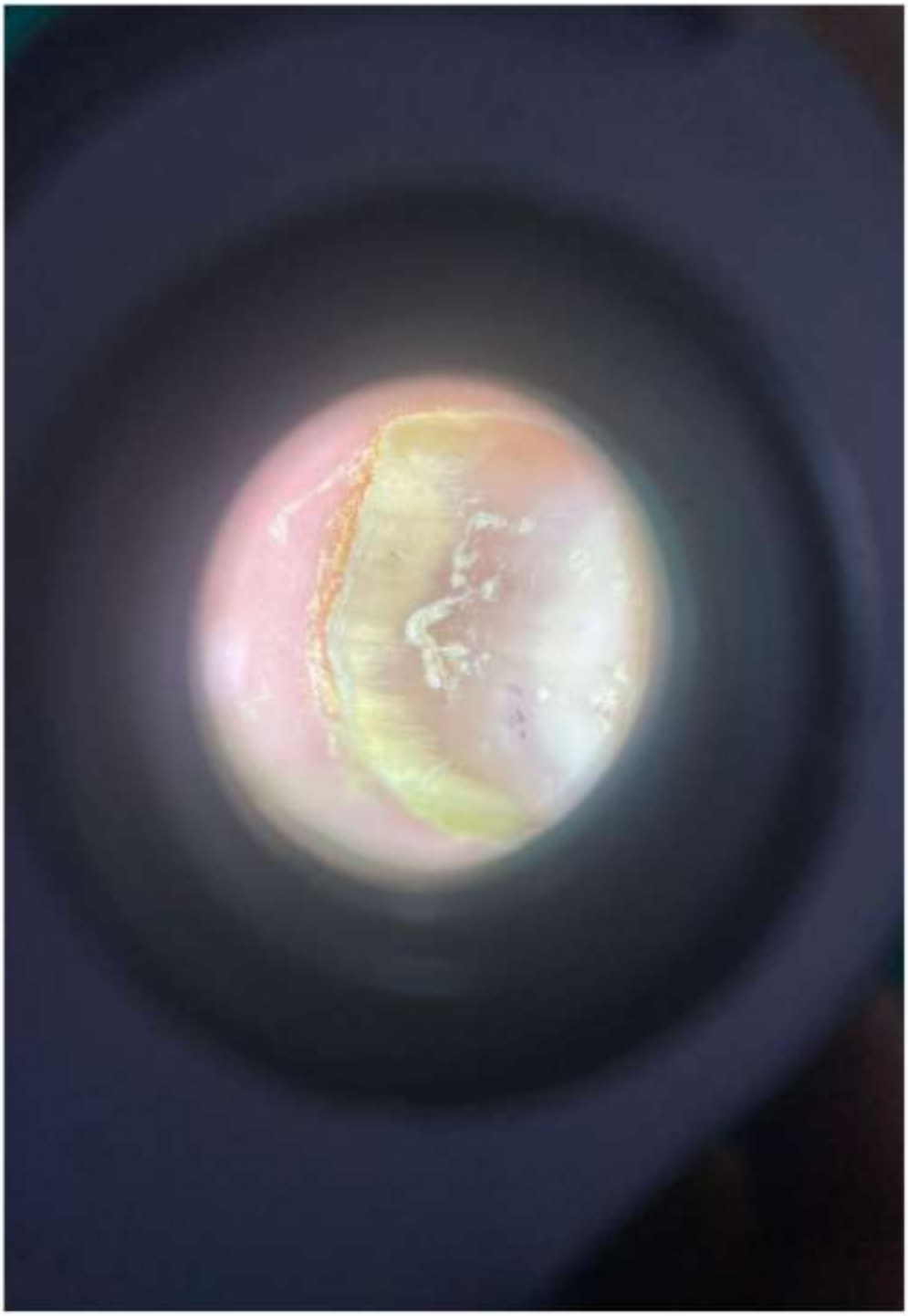


Figure 25: Onycholysis

Figure 26: Onychomycosis

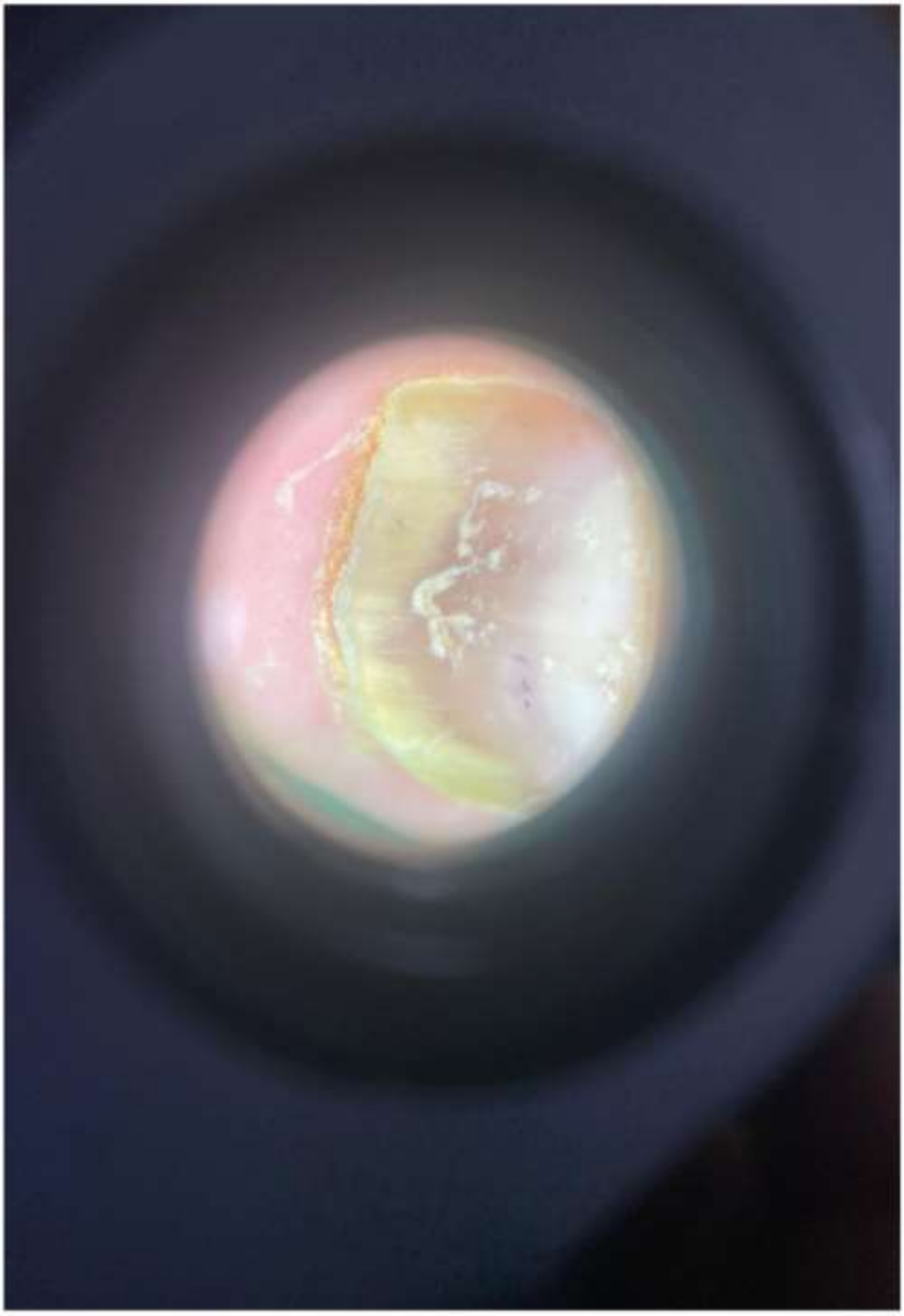


Figure 27: Superficial white onychomycosis

DISCUSSION

DISCUSSION

This was a cross sectional study conducted among 314 individuals between the ages of 30 to 70 years suffering from chronic kidney disease who were admitted to a tertiary hospital with an objective to evaluate the prevalence of various nail manifestations in patients of chronic kidney disease and to study the Onychoscopic changes of various nail manifestations in these patients.

Chronic renal failure correlates with alterations in the skin and nails. The etiology of nail disorders is ambiguous; some appear to be directly associated with renal problems, while others are purportedly linked to consequences or treatments.[78]

In our study, onychoscopic findings were present in almost 82.8% of the study population. In this study 105 (33.4%) of the patients belonged to CKD stage 1, 109 (34.7%) were in stage 2 of CKD and 53 (16.9%) were in stage 3 of CKD. Around 29 (9.2%) patients were in stage 4 and 18 (5.7%) were in stage 5 of CKD. The most common nail change identified in this study was onycholysis (29.9%), followed by leukonychia (24.2%), Splinter hemorrhage (23.9%), melanonychia (23.6%) and longitudinal ridges (21.0%). In the current study the most common nail changes identified among patients with stage 1 CKD was splinter haemorrhage (44.8%). Stages 2, 3 and 4 are characterized by increased prevalence of onycholysis and stage 5 is characterized by absence of lunula.

The mean age of the study population was 50.26 ± 11.64 years. In the study conducted by Dyachenko et al., the mean age was 74.0 ± 11.4 years.[79] In the Martinez et al., study the mean age of the study population was 53.75 ± 14.88 years.[80] In the study conducted by Salem et al., the mean age of the study population was 46.5 ± 11.1 years.[81]

	This study	**Dyachenko et al**[79]	**Martinez et al**[80]	**Salem et al**[81]
Mean age	50.26 ± 11.64	74.0 ± 11.4	53.75 ± 14.88	46.5 ± 11.1

In the current study males constituted 51.6% of the population and females constituted 48.4%. In the Dyachenko et al., study the males constituted 52.1% and females were

47.9%.[79] In the Salem et al., study males constituted 61.0% and females constituted 39.0% of the study population.[81]

	This study	**Dyachenko et al**[79]	**Martinez et al**[80]	**Salem et al**[81]
Males	51.6%	52.1%	61.9%	61.0%

In this study, onychoscopic changes were present in almost 82.8% . As reported in the study by Aqil et al., nail abnormalities were present among 80.0% of the study participants.[77] In the Salem et al., study the prevalence of nail abnormalities were present among 76.0% of the cases.[81]

In this study 105 (33.4%) of the study population belonged to CKD stage 1, 109 (34.7%) were in stage 2 of CKD and 53 (16.9%) were in stage 3 of CKD. Around 29 (9.2%) patients were in stage 4 and 18 (5.7%) were in stage 5 of CKD.

The most common nail change identified in this study was onycholysis (29.9%), followed by leukonychia (24.2%), Splinter hemorrhage (23.9%), melanonychia (23.6%) and longitudinal ridges (21.0%). As reported in the study by Aqil et al., onycholysis has seen in almost 71.4% of the individuals with CKD. Longitudinal ridging was present in 64.2% of cases, splinter haemorrhages in 58.9% of cases and subungual hyperkeratosis in 55.3% of cases. A higher percentage of nail changes were observed in the study conducted by Aqil et al., compared to our study. This may be due to the fact that, a higher percentage of study participants in that study would have been in the later stages of CKD.[77] In the study by Dyachenko et al., the most prevalent nail diseases constituted absence of lunula (16.4%), onychomycosis (13.7%), half and half nails (12.3%), leukonychia (5.5%) and onycholysis (5.5%). Interestingly onycholysis which is a common finding seen in majority of the other studies, was found to be less prevalent in the study conducted by Dyachenko et al.[79]

Onycholysis is a prevalent alteration of the nail that may arise from several local and systemic factors.[82]

Changes in nail consistency, such as brittleness, were observed in 11.1% of individuals. Malnutrition, peripheral circulatory illnesses, and deficiencies in fe and zn may be etiological reason of brittle nails, and conditions are prevalent among hemodialysis patient.[83]

Splinter hemorrhage was another nail issue observed in 23.9% of our patients, with a recorded prevalence ranging from 2% to 58.9%.[84,85]

True leukonychia was observed in 24.2% of the patient cohort. It has been observed in individuals with acute and chronic renal failure, hepatic cirrhosis, those undergoing chemotherapy, and is the predominant nail pathology in renal transplant recipients.[86] It may also arise as a consequence of elevated blood strontium levels.[87] Strontium buildup may result from the ingestion of aluminum-containing phosphate binder in patients undergoing extended renal replacement treatment.[88]

In the study conducted by Martinez et al., the common nail deformities identified were absent lunula (62.9%), onycholysis (43.3%), nail dystrophy (34.0%) and chromonychia (17.5%).

In our study, the absence of lunula was found to be present in only 9.2% of the study participants, while in the Aqil et al., study absence of lunula was seen in almost half of the study participants.[77] This inturn points to the fact that most of the participants in the Aqil et al., study were in CKD stage 5, as absence of lunula is a characteristic feature seen usually seen in stage 5 of CKD. In the study conducted by Dyachenko et al., absence of lunula was the most common nail disease seen among patients with chronic renal failure.[79]

The visibility of the lunula is contingent upon the dimensions of the matrix. The presence of a visible lunula is an indicative indicator, as it may represent the size of the matrix in healthy individuals.

Nail disorder	**This study**	**Aqil et al**[77]	**Dyachenko et al**[79]	**Martinez et al**[80]	**Salem et al**[81]
Onycholysis	29.9	71.4%	5.5%	43.3%	7.0%
Longitudinal ridging	21.0	64.2%		12.4%	4.0
Splinter hemorrhages	23.9	58.9%	2.7%	7.2%	2.0
Subungual hyperkeratosis	13.7	55.3%			3.0
Absence of lunula	9.2	51.7%	16.4%	62.9%	17.0%

Signs of onychomycosis	12.7	48.2%	13.7%		4.0
Beau's lines	8.6	35.7%		5.2%	5.0
Leukonychia	24.2	25%	5.5%	4.1%	2.0
Melanonychia	23.6	14.2%		9.3%	
Brittle nails	11.1	10.7%			5.0
Pincer-nail deformity	6.7	10.7%			2.0
Koilonychias	13.1	7.1%		1.0%	3.0
Muehrcke lines	5.4	7.1%		1.0%	
Paronychia	15.9	5.4%			

In the current study the most common nail changes identified among patients with stage 1 CKD was splinter haemorrhage (44.8%), followed by longitudinal ridges (24.8%), melanonychia (23.8%), onycholysis (22.9%) and leukonychia (21.0%). Absence of lunula was the least common nail deformity .

In those patients with Stage 2 CKD, the most common nail deformity identified was onycholysis (28.4%), closely followed by leukonychia (24.8%), melanonychia (22.0%) and paronychia (20.2%). The least common nail deformity found in stage 2 CKD was Muehrcke's lines (4.6%).

In patients with stage 3 CKD, the most common nail deformity identified was onycholysis (41.5%), closely followed by leukonychia (24.5%), melanonychia (24.5%) and longitudinal ridges (22.6%). The least common nail deformity that was observed in stage 3 CKD was absence of lunula (1.9%).

Stage 4 CKD was characterized by the following nail deformities – onycholysis in 34.5% of the cases, leukonychia in 31.0% of the cases, melanonychia in 27.6% of the cases and longitudinal ridges in 20.7% of the cases. The least common nail deformity found in stage 4 CKD was Muehrcke's lines (3.4%). Pincer nail deformity was found to be absent in stage 4 CKD cases.

The other common nail deformities observed in stage 5 CKD were, onycholysis (38.9%), leukonychia (27.8%), onychomycosis (22.2%) and melanonychia (22.2%).

The least common nail deformity observed was Muehrcke's lines (5.6%), pincer nail deformity (5.6%) and Beau's lines (5.6%).

In our study there was absence of Lindsay's nails, or "half and half" nails. They are a common nail manifestation of chronic kidney disease (CKD), particularly in late stages. However, not all afflicted people have them. Multiple variables may explain this clinical sign's absence:

2. Individual variation and Genetic Factors: Genetics, skin and nail bed structure, and disease-related variables such melanin deposition and capillary alterations may affect half-and-half nail development. Despite severe renal failure, some individuals may never acquire this result.

3. Differences in Skin and Nail Pigmentation: Darker skin tones may make it harder to distinguish the proximal and distal nail portions, making clinical identification difficult.

4. Effect of Other Nail Changes and Comorbidities: Many CKD patients have diabetes, cardiovascular disease, and malnutrition, which may induce nail alterations independently. Concurrent anomalies may hide or alter half-and-half nails. Hospitalized individuals may have nail dystrophies due to systemic diseases, drugs, or repetitive trauma, which may conceal the typical appearance.

CONCLUSION

CONCLUSION

In our investigation, onychoscopic findings were seen in about 82.8% of the population examined. In this research, 105 patients (33.4%) were classified as stage 1 CKD, 109 patients (34.7%) as stage 2 CKD, and 53 patients (16.9%) as stage 3 CKD. Approximately 29 (9.2%) individuals were classified as stage 4, whereas 18 (5.7%) were classified as stage 5 of chronic kidney disease (CKD). The predominant nail alteration seen in this research was onycholysis (29.9%), followed by leukonychia (24.2%), splinter hemorrhage (23.9%), melanonychia (23.6%), and longitudinal ridges (21.0%). The most prevalent nail alteration seen in individuals with stage 1 chronic kidney disease (CKD) in the present investigation was splinter hemorrhage (44.8%). Stages 2, 3, and 4 are marked by a heightened occurrence of onycholysis, whereas stage 5 is distinguished by the lack of the lunula.

Various nail changes are present in patients with chronic kidney disease ranging from the common onycholysis to much rare Meuhrcke's lines. The prevalence of various nail deformities changed with the stage of the chronic kidney disease with Splinter hemorrhages more common in stage 1 of the disease. Stages 2, 3 and 4 are characterized by increased prevalence of onycholysis and stage 5 is characterized by absence of lunula.

Frequent onychoscopic examination of the nails of patients with CKD can determine the stage of the disease and thereby classify them accordingly.

LIMITATIONS

LIMITATIONS

- The main limitation of the study was shorter time period
- Another limitation was the lack of follow up
- The pathogenesis of many of the nail changes could not be studied in detail in this study due to the time limitations.

SUMMARY

SUMMARY

This was a cross sectional study conducted among 314 individuals between the ages of 30 to 70 years suffering from chronic kidney disease who were admitted to a tertiary hospital with an objective to evaluate the prevalence of various nail manifestations in patients of chronic kidney disease and to study the Onychoscopic changes of various nail manifestations in these patients.

- The 'mean age of the' study population was 50.26 ± 11.64 years
- In the current study males constituted 51.6% of the population and females constituted 48.4%.
- In this study, onychoscopic changes were present in almost 82.8% of the study population.
- In this study 105 (33.4%) of the study population belonged to CKD stage 1, 109 (34.7%) were in stage 2 of CKD and 53 (16.9%) were in stage 3 of CKD. Around 29 (9.2%) patients were in stage 4 and 18 (5.7%) were in stage 5 of CKD.
- In the current study the most common nail changes identified among patients with stage 1 CKD was splinter haemorrhage (44.8%)
- Stages 2, 3 and 4 are characterized by increased prevalence of onycholysis and stage 5 is characterized by absence of lunula.

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ANNEXURES

ANNEXURE I

PROFORMA

Case number

Patient particulars

NAME:	**UHID:**
AGE:	**DATE:**
GENDER:	
ADDRESS: **PHONE NUMBER:**	**Occupation:**

DIAGNOSISAND STAGE OF THE DISEASE:

eGFR CALCULTION:

INVESTIGATIONS:

TREATMENT HISTORY:

ON EXAMINATION:

1)GENERAL PHYSICAL EXAMINATION:

Built and Nourishment:

Pallor/ Icterus/ Clubbing/ Cyanosis/ Significant lymph node enlargement/ Edema

Vitals: Temperature-

Pulse -

Blood pressure-

Respiratory rate-

2)Nail examination- **CLINICAL** **ONYCHOSCOPIC**

1.Nail plate

2.Nail Bed

3.Nail fold

4.Onychoscopic Features

5.Hyponychium

6.Cuticle

7.Lunula

3)CUTANEOUS EXAMINATION:

Sites of involvement:

Morphology of the lesions:

4)Oral / mucosal examination –

<u>INVESTIGATIONS:</u>

Complete Hemogram

RFT

Urine Routine

ANNEXURE II

PATIENT CONSENT FORM

Title of the study: ONYCHOSCOPIC NAIL CHANGES IN PATIENTS

WITH CHRONIC KIDNEY DISEASE: A CROSS SECTIONAL STUDY.

Name of the Participant:

Name of the Principal investigator: Dr. YERAGONDA SUSMITHA

Name of the Institution: R.L Jalappa Hospital and Research Centre, Tamaka, Kolar.

Documentation of the informed consent

I Ms./Mrs. _____ have been explained in my own

understandable language, that I will be included in the study which is "

1. I have read and understood this consent form and the information provided to me.

2. I have had the consent document explained to me.

3. I have been explained that my clinical findings, investigations, will be assessed and documented for study purpose

4. I have informed the investigator of all the treatments I have been taking or have taken in the past.

5. I agree to cooperate with the investigator and will inform him immediately if I suffer unusual symptoms.

6. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my relation with my doctor or the treatment for my ailment in this hospital.

7.I have understood that all the details found during the study are kept confidential and while publishing or sharing of the findings, the details will be masked. I hereby give permission to the investigators to release the information obtained from me as a result of participation in this study

8. I have decided to be included in this research study.

9. I am aware that if I have any question during this study, I should contact my principal investigator mobile number for enquiries.

I _____ was free to ask any questions which were answered

and clarified, I do hereby give my consent to be included as a participant in the study.

By signing this consent form I attest that the information given in this document has been clearly explained to me and apparently understood by me. I will be given a copy of this consent document**.**

Participant's initial:_____

Name and signature/thumb impression of the participant

_____ _____ _____

Name

Signature

Date

Name and signature of witness

_____

_____

_____

Name

Signature

Date

Name and Signature of the investigator obtaining consent:

_____

_____

_____

Name

Signature

Date

ರ\3ಗಿಯಸಮ್ಮತಿನಮೂನೆ

ಅಧ್ಯಯನದಶೀರ್ಷಿಕೆ:ದೀಘ್ರಕಾಲದಮೂತ್ರಪಂಡಕಾಯಿಲೆಯರ\3ಗಿಗಳಲ್ಲಿ ಒ ನಿಕೊಸೂಕೀಪ

ಕ್ಅಗುರುಬದಲಾವಣೆಗಳು: ಒಂದುಅಡ್ಡವಿಭಾಗದಅಧ್ಯಯನ.

ಭಾಗವಹಿಸುವವರರಸರು:

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಯ ರಸರು :ಡಾ. ಯರಗೊಂಡಸುಸ್ಮತಾ.

ಸಂಸ್ಥಿಯ ರಸರು: R.L ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರ ಮತುತು ಸಂಶ\3ಧನಾ ಕೇಂದ್ರ, ಟಮಕ, ಕೆ\3ಲಾರ.

ತಿಳುವಳಿಕೆಯುಳ್ಳಒಪ್ಪಗೆಯದಾಖಲೆ
ಶ್ರೀಮತಿ/ಶ್ರೀಮತಿ. _____

ಅನುನುನನನುದೀಆದಅಥ್ಪಿವಾಗುವಭಾಷೆಯಲ್ಲಿವಿವರಸಲಾಗಿದ, ನಾನುಅಧ್ಯಯನದಲ್ಲಿಸೀರಸಲ್ಪಡುತತುೀನೆ

“1.ನಾನುಈಒಪ್ಪಗೆಯರೂಪವನುನುಓದದ್ೀನೆಮತುತುಅಥ್ಪಿಮಾಡಿಕೊಂಡಿ ದ್ೀನೆಮತುತುನನಗೆಒದಗಿ ಸದಮಾಹಿತಿಯನುನುನಾನುಓದದ್ೀನೆ

.2. ನಾನುಒಪ್ಪಗೆಯದಾಖಲೆಯನುನುನನಗೆವಿವರಸದ್ೀನೆ.3. ನನನುಕ್ಲಿನಿಕಲ್ಸಂಶ\3ಧನೆಗಳು,

ತನಿಖೆಗಳನುನುಮೌಲ್ಯಮಾಪನಮಾಡಲಾಗುತತುದಮತುತುಅಧ್ಯಯನದಉ ದ್ೀಶಕಾಕಗಿದಾಖಲಸಲಾ

ಗುವುದುಎಂದುನನಗೆವಿವರಸಲಾಗಿದ.

ನಾನುಈಹಿಂದತಗೆದುಕೊಳ್ಳುತಿತುರುವಅಥವಾತಗೆದುಕೊಂಡಿರುವಎಲಾಲಿ ಚಿಕತ್ಸೆಗಳಬಗೆಗೆತನಿಖಾಧಿಕ

ಾರಗೆತಿಳಿಸದ್ೀನೆ.5.

ನಾನುತನಿಖಾಧಿಕಾರಯಂದಗೆಸಹಕರಸಲುಒಪುಪುತತುೀನೆಮತುತುನಾನುಅ ಸಾಮಾನ್ಯರ\3ಗಲಕ್ಷಣ

ಗಳನುನುಅನುಭವಿಸದರತಕ್ಷಣವೇಅವರಗೆತಿಳಿಸುತತುೀನೆ.6.

ಯಾವುದೇಕಾರಣವನುನುನೀಡದಯೇನಾನುಯಾವುದೇಸಮಯದಲ್ಲಿಅಧ್ಯ ಯನದಂದರೂರಗು

ಳಿಯಬಹುದುಮತುತುಇದುನನನುವೈದ್ಯರೂಂದಗಿನನನನುಸಂಬಂಧಅಥ ವಾಈಆಸ್ಪತ್ರಯಲ್ಲಿನನನನುಕಾ

ಯಿಲೆಯಚಿಕತ್ಸೆಯಮೇಲೆಪರಣಾಮಬೀರುವುದಲ್ಲಿಎಂಬಸತ್ಯದಬಗೆಗೆನನಗೆತಿ ಳಿದದ. 7.

ಅಧ್ಯಯನದಸಮಯದಲ್ಲಿಕಂಡುಬರುವಎಲಾಲಿವಿವರಗಳನುನುಗೌಪ್ಯವಾಗಿಇ ರಸಲಾಗುತತುದಮತುತು

ಸಂಶ\3ಧನೆಗಳನುನುಪ್ರಕಟಿಸುವಾಗಅಥವಾಹಂಚಿಕೊಳ್ಳುವಾಗ,

ವಿವರಗಳನುನುಮರಮಾಚಲಾಗುತತುದಎಂದುನಾನುಅಥ್ಪಿಮಾಡಿಕೊಂಡಿದ್ ೀನ

ಈಅಧ್ಯಯನದಲ್ಲಿಭಾಗವಹಿಸದಪರಣಾಮವಾಗಿನನಿನುಂದಪಡೆದಮಾಹಿತಿಯ
ನುನುಬಡುಗಡೆಮಾ
ಡಲುತನಿಖಾಧಿಕಾರಗಳಿಗೆನಾನುಈಮೂಲಕಅನುಮತಿನೀಡುತತು◌ೀನೆ 8.
ನಾನುಈಸಂಶ\3ಧನಾಅಧ್ಯಯನದಲ್ಲಿಸೀರಸಕೊಳ್ಳಲುನಿಧ್ಪಿರಸದ್◌ೀನೆ.9.
ಈಅಧ್ಯಯನದಸಮಯದಲ್ಲಿನಾನುಯಾವುದೇಪ್ರಶನುಗಳನುನುರೂಂದದ್ರ,
ವಿಚಾರಣೆಗಾಗಿನಾನುನನನುಪ್ರಧಾನತನಿಖಾಧಿಕಾರಯಮೊಬ್ಯಲ್ಸೆಂಖೆಯಯ
ನುನುಸಂಪಕ್ಷಿಸಬೀಕುಎಂ

ದುನನಗೆತಿಳಿದದ. ನಾನು _____

ಉತತುರಸುವಮತುತುಸ್ಪಷಟುಪಡಿಸದಯಾವುದೇಪ್ರಶನುಗಳನುನುಕೇಳಲು
ಮುಕತುನಾಗಿದ್◌ೀನೆ,
ನಾನುಭಾಗವಹಿಸುವವನಾಗಿಸೀರಸಕೊಳ್ಳಲುನನನುಒಪ್ಪಗೆಯನುನುನೀಡುತ
ತು◌ೀನೆಅಧ್ಯಯನದಲ್ಲಿ.
ಈಸಮ್ಮತಿಯನಮೂನೆಗೆಸಹಿಮಾಡುವಮೂಲಕಈಡಾಕುಯಮಂಟ್
ನಲ್ಲಿನೀಡಲಾದಮಾಹಿತಿಯ
ನುನುನನಗೆಸ್ಪಷಟುವಾಗಿವಿವರಸಲಾಗಿದಮತುತುಸ್ಪಷಟುವಾಗಿನನಗೆಅಥ್ಪಿ
ವಾಗಿದಎಂದುನಾನುದೃಢೀಕರ ಸುತತು◌ೀನೆ.
ನನಗೆಈಸಮ್ಮತಿಯದಾಖಲೆಯನಕಲನುನುನೀಡಲಾಗುವುದು.
ಭಾಗವಹಿಸುವವರಮೊದಲನ:_____

ಭಾಗವಹಿಸುವವರರಸರುಮತುತುಸಹಿ/ರಬ್ಬರಳಿನಗುರುತು _____

_____ _____
ರಸರುಸಹಿದನಾಂಕಮತುತುಸಾಕ್ಷಿಯಸಹಿ

_____

_____

_____

_____

_____

ರಸರು

ಸಹಿ

ದನಾಂಕ

ANNEXURE III

PATIENT INFORMATION SHEET

Study title: ONYCHOSCOPIC NAIL CHANGES IN PATIENTS OF

CHRONIC KIDNEY DISEASE: A CROS SECTIONAL STUDY.

Study site: R.L Jalappa Hospital and research centre, Tamaka, Kolar.

Some of the nail manifestations in chronic kidney disease patients are Absence of lunula,splinterhemorrhages, onycholysis, Beau's line, koilonychias, onychomycosis, brittle nails.

These Nail manifestations can be diagnosed by Onychoscopy.

Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in this study we will collect information (as per proforma) from you. Relevant blood investigations will be carried out if required. This information collected will be used for dissertation and publication only.

All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. The expenses required for the investigations will be funded by the study investigator. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the member of the Institutional Ethics Committee. There is no compulsion to agree to this study. The care that you get will not change even if you don't wish to participate. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study. No monetary benefits will be given to the patients participating in the study.

For any further clarification you can contact the study investigator:

Dr.YERAGONDA SUSMITHA

Mobile no: 8522899673

E-mail id: drsushmithareddy1696@gmail.com

ರ\3ಗಿಗಳಮಾಹಿತಿಹಾಳೆ

ಅಧ್ಯಯನದಶೇರ್ಷಿಕೆ:

ದೇಷ್ಟಿಕಾಲದಮೂತ್ರಪಂಡಕಾಯಿಲೆಯರ\3ಗಿಗಳಲ್ಲಿ ಒನಿಕೊಸೂಕೇಪಕ್ ಉಗುರುಬದಲಾವಣೆಗಳು:

ಒಂದುಕ್ರಸ್ಸೆಕ್ಷನಲ್ಸೆಸ್ಟಡಿ. ಅಧ್ಯಯನತಾಣ: ಆರ್.ಎಲಾಜಾಲಪ್ಪಆಸ್ಪತ್ರಮತುತು ಸಂಶ\3ಧನಾಕೇಂದ್ರ, ತಮಕ,

ಕೆ\3ಲಾರ.

ಉದ್ೀಶ:

ದೇಷ್ಟಿಕಾಲದಮೂತ್ರಪಂಡಕಾಯಿಲೆರ\3ಗಿಗಳಲ್ಲಿವಿವಿಧಉಗುರುಅಭಿವ್ಯಕತುಗಳಹರಡುವಿಕೆಮತುತುಒನಿಕೊಸೂಕ

ೀಪಕ್ಪದಲಾವಣೆಗಳನುನುಮೌಲ್ಯಮಾಪನಮಾಡಲು.

ದೇಷ್ಟಿಕಾಲದಮೂತ್ರಪಂಡಕಾಯಿಲೆಯರ\3ಗಿಗಳಲ್ಲಿಕೆಲವುಉಗುರುಅಭಿವ್ಯಕತುಗಳೆಂದರಲುನುಲಾಅನುಪಸ್ಥಿತಿ

, ಸ್ಪಪಂಟರ್ಷಿಮರೇಜ್, ಒನಿಕೊಲಸಸ್, ಬೂಯಸ್ಲಿಲೈನ್, ಕೊಯಿಲೆ\3ನಿಚಿಯಾಸ್, ಒನಿಕೊಮ್ಯಕೆ\3ಸಸ್,

ಸುಲಭವಾಗಿಉಗುರುಗಳು. ಈಉಗುರುಅಭಿವ್ಯಕತುಗಳನುನು ಒನಿಕೊಸೂಕೇಪ

ಮೂಲಕರ\3ಗನಿಣ್ಪಿಯಮಾಡಬಹುದು.

ದಯವಿಟುಟುಕೆಳಗಿನಮಾಹಿತಿಯನುನುಓದಮತುತುನಿಮ್ಮಕುಟುಂಬದಸದಸ್ಯ
ರೂಂದಗೆಚರ್ಚಿಷಿಸ.

ಅಧ್ಯಯನಕೆಕಸಂಬಂಧಿಸದಂತನೀವುಯಾವುದೇಪ್ರಶನುಯನುನುಕೇಳಬಹುದು.

ಈಅಧ್ಯಯನದಲ್ಲಿಭಾಗವಹಿಸಲುನೀವುಒಪ್ಪದರನಾವುನಿಮ್ಮಂದಮಾಹಿತಿಯನುನು
(ಪ್ರ
ಫಾಮರ್ಷಿಪ್ರಕಾರ)

ಸಂಗ್ರಹಿಸುತತುೀವೆ.
ಅಗತ್ಯವಿದ್ರಸಂಬಂಧಿತರಕತುಪರೀಕ್ಷೆಗಳನುನುಕೈಗೊಳ್ಳಲಾಗುತತುದ.
ಸಂಗ್ರಹಿಸದಈಮಾಹಿತಿಯನುನುಪ್ರಬಂಧಮತುತುಪ್ರಕಟಣೆಗೆಮಾತ್ರಬಳಸಲಾಗುತ
ತುದ.
ನಿಮ್ಮಂದಸಂಗ್ರಹಿಸಲಾದಎಲಾರ್ಲಿಮಾಹಿತಿಯನುನುಗೌಪ್ಯವಾಗಿಇರಸಲಾಗುತತುದ
ಮತುತುಯಾವುದೇರೂರಗಿನವರಗೆಬ

ಹಿರಂಗಪಡಿಸಲಾಗುವುದಲ್ಲಿ. ನಿಮ್ಮಗುರುತನುನುಬಹಿರಂಗಪಡಿಸಲಾಗುವುದಲ್ಲಿ.
ತನಿಖೆಗಳಿಗೆಅಗತ್ಯವಿರುವವೆಚ್ಚಗಳನುನುಅಧ್ಯಯನತನಿಖಾಧಿಕಾರಗಳುಧನಸಹಾ
ಯಮಾಡುತಾತುರ.
ಈಅಧ್ಯಯನವನುನುಸಾಂಸ್ಥಿಕನೀತಿಶಾಸ್ತ್ರಸಮತಿಯುಪರಶೀಲಸದಮತುತುನೀವು
ಸಾಂಸ್ಥಿಕನೀತಿಶಾಸ್ತ್ರಸಮತಿಯಸ

ದಸ್ಯರನುನುಸಂಪಕ್ಷಿಸಲುಮುಕತುರಾಗಿದ್ೀರ.
ಈಅಧ್ಯಯನವನುನುಒಪ್ಪಕೊಳ್ಳಲು
ಯಾವುದೇಒತಾತುಯವಿಲ್ಲಿ.

ನೀವುಭಾಗವಹಿಸಲುಬಯಸದದ್ದೂಸಹನೀವುಪಡೆಯುವಕಾಳಜಿಯುಬದಲಾಗುವುದಲ್ಲಿ.

ಈಅಧ್ಯಯನದಲ್ಲಿಭಾಗವಹಿಸಲುನೀವುಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದಸಮ್ಮತಿಸದರಮಾತ್ರ ನೀವುಸಹಿ/ರಬ್ಬರಳಿನಗುರ

ುತನುನುಒದಗಿಸಬೇಕಾಗುತತುದ.

ಅಧ್ಯಯನದಲ್ಲಿಭಾಗವಹಿಸುವರ\3ಗಿಗಳಿಗೆಯಾವುದೇಹಣಕಾಸನಪ್ರಯೋಜನಗಳನುನುನೀಡಲಾಗುವುದಲ್ಲಿ.

ಯಾವುದೇರಚಿತನಸ್ಪರಟುೀಕರಣಕಾಕಗಿನೀವುಅಧ್ಯಯನತನಿಖಾಧಿಕಾರಯನುನುಸಂಪಕ್ಸಿಸಬಹುದು.ಡಾ.

ಯರಗೊಂಡಸುಸ್ಮತಾ

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KEY TO MASTER CHART

HEADINGS :

1. **UHID** = Unique Hospital Identiy Number
2. **S.Cr** = Serum Creatinine
3. **Gen** = Gender
4. **CKD st** = Chronic Kidney Disease stage

Onychoscopic findings :

1. **Ol** = **Onycholysis**
2. **SH** = **Splinter Haemorrhages**
3. **BL** = **Beau's lines**
4. **KY** = **Koilonychia**
5. **OM** = **Onychomycosis**
6. **BN** = **Brittle Nails**
7. **LY** = **Leuconychia**
8. **LR** = **Longitudinal Ridges**
9. **SUH** = **Sub Ungual Hyperkeratosis**
10. **PY** = **Paronychia**

11.PN = Pincer Nail Deformity

12.MU = Mueherck lines

13.ME = Melanonychia

14.PIT = Pitting of nails

MASTER CHART

SL_NO	UHID	AGE	GEN	S.Cr	CKD st	OL	SH	BL	KY	OM	BN	LY	LR	SUH	PY	PN	MU	ME	PIT
1	231674	37	M	7.1	2	2	1	1	2	1	1	2	2	2	2	1	1	2	1
2	261926	48	F	2.1	1	1	2	2	2	2	2	1	2	1	2	1	1	2	1
3	298984	57	F	16.2	3	1	2	2	2	2	2	1	1	1	2	2	1	1	1
4	409044	56	F	13.9	3	1	1	1	1	2	2	2	2	1	2	2	1	1	2
5	543219	59	F	11	2	1	1	1	1	2	2	1	1	1	2	2	2	1	2
6	260316	41	F	3.7	1	2	2	2	2	1	1	2	2	2	2	1	1	2	1
7	373806	55	M	13.6	3	2	2	2	2	2	2	1	2	1	2	1	2	1	1
8	495480	45	F	4.1	1	1	2	1	2	1	1	1	1	2	2	1	2	1	1
9	284701	34	F	6	1	1	1	1	2	1	2	1	2	2	1	2	1	1	2
10	387796	45	M	2.1	1	2	2	1	2	1	1	2	2	1	2	1	1	1	2
11	373913	48	M	2.2	1	1	2	1	2	1	1	2	1	1	1	1	1	1	2
12	272068	53	M	9.9	2	1	2	1	1	1	2	2	2	1	2	2	1	2	2
13	341883	68	M	3.6	1	1	2	1	2	2	1	2	2	2	2	1	1	2	2
14	511703	53	M	6.6	1	2	2	2	1	1	2	1	1	1	2	1	2	2	1
15	466795	32	F	8.1	2	2	1	1	1	1	2	2	2	1	1	1	2	2	1
16	284270	42	M	19.4	5	1	2	2	1	2	2	2	1	1	1	1	1	2	1
17	480942	42	M	1	1	1	2	2	2	2	2	2	2	1	1	1	1	2	1
18	331127	59	M	18.6	4	2	2	2	1	1	2	1	2	2	1	1	2	1	2
19	332774	61	M	10.6	2	2	1	1	1	2	2	1	2	2	2	2	2	1	2
20	481951	55	F	1.3	1	2	2	2	2	1	2	1	2	1	2	1	2	1	1
21	380651	70	M	6.6	1	1	2	2	2	2	2	1	2	1	2	1	2	1	1
22	358677	68	M	4.7	1	1	2	2	2	2	2	2	1	1	2	2	2	2	2
23	288828	70	F	9.5	2	2	1	2	2	1	2	2	1	1	2	2	2	1	2
24	605671	34	M	5.9	1	2	2	2	2	1	1	2	1	2	2	1	1	1	2
25	344375	40	M	17	4	1	1	2	2	2	2	1	1	1	2	1	2	2	1
26	356153	34	F	16.4	3	2	2	1	2	2	2	2	1	2	2	1	1	2	2
27	314364	38	M	19.5	5	1	2	1	1	1	2	2	1	1	2	2	1	2	1
28	316265	36	F	2.7	1	2	1	1	2	2	1	1	2	1	1	2	1	1	1

29	295771	33	M	17	3	1	2	2	2	2	2	1	1	1	2	2	2	2	2
30	571621	40	M	4.6	1	2	2	2	2	2	2	2	1	2	1	1	2	1	1
31	335701	35	M	9.8	2	1	2	1	1	1	2	2	2	1	1	1	2	2	2
32	486879	57	M	12.2	2	1	2	2	2	2	1	1	1	2	2	1	1	2	2
33	490224	67	F	5.3	1	2	1	1	2	1	2	1	2	2	1	1	1	1	2
34	410810	44	F	15.9	3	1	1	1	1	1	2	1	1	2	2	2	2	2	2
35	608017	60	M	17.7	4	2	1	2	1	2	1	1	1	2	1	1	1	1	2
36	326464	36	F	16.5	3	1	2	1	2	2	1	1	2	2	2	1	2	2	1
37	322578	36	F	2.7	1	1	1	1	2	2	1	2	1	2	1	1	1	2	1
38	289701	65	M	18.1	4	2	2	2	1	2	2	2	2	2	2	1	2	1	2
39	533674	62	F	4.2	1	2	2	2	1	2	2	2	2	1	2	2	2	1	1
40	429537	33	M	15.2	3	2	2	1	2	2	1	1	2	2	1	1	1	1	1
41	617711	56	F	15.6	3	2	1	2	1	2	1	2	2	1	2	1	1	1	1
42	597019	43	F	2.3	1	2	2	2	2	2	2	2	1	2	2	2	2	2	1
43	494729	56	M	7.6	2	1	1	2	2	1	2	2	1	2	2	2	2	1	2
44	596821	38	M	1.9	1	2	2	2	2	1	2	2	2	1	2	1	1	1	2
45	317313	35	F	10.5	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2
46	377095	40	M	4.3	1	1	2	1	2	1	1	2	2	1	2	2	1	2	2
47	274914	38	M	19	5	2	1	2	1	1	2	2	2	2	1	2	2	1	1
48	461498	55	F	5.6	1	2	2	2	1	1	2	2	1	1	1	1	2	1	2
49	285019	70	M	8.4	2	2	1	1	1	1	1	2	1	2	1	2	2	2	1
50	453929	45	F	7.5	2	2	1	2	1	1	1	2	1	2	2	2	2	2	2
51	376562	47	M	2.2	1	1	1	1	2	2	1	2	2	2	1	2	2	1	1
52	595781	56	M	18	4	2	2	1	2	2	2	2	1	2	2	1	1	2	2
53	617262	68	F	9.2	2	2	2	2	1	2	2	2	1	2	2	1	1	2	2
54	284711	45	M	1.9	1	2	2	1	1	2	2	1	2	1	1	1	1	1	2
55	600033	50	M	11.5	2	2	2	1	1	1	2	1	2	2	2	2	2	1	1
56	606062	33	M	17.4	4	1	1	2	2	1	1	2	2	2	2	1	1	1	2
57	342465	36	M	3.7	1	2	2	1	1	2	1	2	1	2	1	2	1	2	2
58	583075	43	M	17.1	4	2	1	2	2	1	2	1	2	2	1	2	1	2	1

59	417739	68	M	9.6	2	2	2	2	2	1	2	1	2	2	2	1	1	1	1
60	575428	50	F	4.8	1	1	1	2	1	1	2	2	1	2	2	2	2	1	2
61	303107	46	M	4.3	1	1	2	1	1	2	2	1	2	2	1	1	1	2	1
62	502940	64	M	6.9	2	1	1	1	2	1	2	2	1	1	1	1	1	1	2
63	355577	54	M	18.4	4	1	2	1	1	1	1	2	1	1	2	1	1	1	2
64	536153	69	F	10.5	2	2	2	1	2	1	1	2	1	1	1	1	2	1	2
65	441132	49	M	2.5	1	2	1	1	2	1	2	1	1	2	1	1	1	2	1
66	619874	47	M	12	2	2	2	2	2	1	2	1	1	1	1	1	1	1	2
67	498686	66	F	12.4	2	1	2	1	2	1	1	2	2	2	2	2	1	1	1
68	410590	56	F	9.4	2	2	2	1	1	2	2	1	1	1	2	2	2	1	2
69	603181	49	M	19.7	5	1	1	2	1	1	1	2	2	1	1	1	2	2	1
70	525593	44	M	7.2	2	1	2	2	2	1	2	1	2	2	1	2	1	1	2
71	312176	35	F	2.7	1	2	2	1	1	1	2	2	1	1	2	1	1	1	2
72	281692	69	M	14.1	3	1	1	1	2	1	2	1	1	1	1	1	2	2	2
73	304558	48	F	10.6	2	1	1	1	2	2	2	1	2	2	1	2	2	2	1
74	513501	35	F	2.6	1	2	2	2	1	2	2	2	2	1	1	2	1	1	2
75	382064	49	M	10.8	2	2	2	1	1	2	2	1	2	1	1	2	2	1	1
76	542846	39	F	3.1	1	1	1	2	2	2	2	1	1	1	2	1	1	2	2
77	320885	53	F	11	2	2	1	2	1	1	2	1	1	1	1	1	1	1	1
78	279328	67	M	18.1	4	2	2	1	1	1	1	1	1	2	1	2	1	1	2
79	282960	67	M	16.7	3	1	1	1	1	1	2	1	1	2	1	2	2	2	1
80	337648	36	F	10.8	2	2	1	2	2	1	2	2	1	2	1	1	1	1	2
81	469948	31	M	11.6	2	2	2	2	2	1	2	2	2	1	1	1	2	1	1
82	511840	53	M	10.4	2	1	2	2	2	2	2	1	2	2	1	2	1	1	2
83	546657	35	F	12.1	2	2	2	1	1	2	2	2	2	2	2	2	1	1	2
84	332752	43	F	8.1	2	2	2	1	2	1	1	2	1	2	1	1	2	1	2
85	434481	60	F	9.4	2	2	2	1	2	2	2	2	2	2	1	2	1	2	2
86	440388	32	M	6.6	1	2	1	2	1	2	2	1	2	1	1	1	1	2	1
87	633171	59	M	3.4	1	2	2	2	2	2	1	1	2	1	1	2	2	2	2
88	490061	48	M	5.2	1	2	1	1	2	2	1	1	1	1	2	1	1	1	2

89	455761	55	M	8.9	2	2	2	2	2	2	1	2	2	2	2	1	2	1	1
90	425887	36	F	7.5	2	1	2	1	1	1	2	2	2	1	2	1	2	2	1
91	421993	68	F	11.9	2	1	1	1	1	1	1	1	2	2	1	2	2	1	2
92	355900	69	F	14.1	3	1	2	2	2	1	2	1	2	2	2	2	1	2	1
93	511888	69	M	14.7	3	2	2	1	1	1	2	1	1	1	1	2	2	1	1
94	381384	61	F	7.8	2	1	1	1	1	1	1	2	2	2	1	1	2	1	2
95	418606	53	M	1.7	1	2	2	1	2	1	1	1	1	2	1	2	1	1	1
96	302810	64	F	9.9	2	2	2	1	2	2	1	1	2	2	1	1	2	1	1
97	461970	56	F	11.3	2	1	1	1	1	1	1	2	2	1	2	1	2	1	2
98	442174	57	F	7.2	2	2	2	2	2	1	2	1	2	2	1	1	1	1	1
99	445952	42	M	17.7	4	2	1	2	1	2	2	2	1	2	1	2	2	1	1
100	381255	30	F	10.7	2	1	2	1	1	1	2	1	1	1	1	1	2	2	1
101	320997	64	M	3.5	1	2	2	2	1	2	2	1	2	1	1	2	1	1	2
102	296593	42	F	10.7	2	1	1	2	1	2	2	1	1	2	2	2	1	1	1
103	293716	66	F	2.1	1	2	2	1	1	1	2	1	1	2	2	2	1	1	2
104	264957	68	M	1.9	1	2	2	2	1	2	1	1	2	2	2	2	2	2	1
105	304642	56	M	17.7	4	1	1	2	1	1	1	2	2	2	1	2	2	2	1
106	428619	35	F	17.9	4	1	2	2	1	1	1	2	2	2	1	1	1	2	1
107	348539	54	F	12.5	2	2	2	2	1	2	2	1	1	1	2	2	1	2	2
108	558740	35	M	4.4	1	1	1	2	1	1	2	2	1	2	2	2	2	2	2
109	620570	30	F	6.6	1	2	1	1	2	1	2	1	1	1	2	1	2	1	1
110	487957	60	F	7.1	2	1	2	1	1	1	2	2	2	1	2	1	1	2	1
111	334848	51	M	6.9	2	2	2	1	1	1	1	1	2	2	2	1	2	1	2
112	477622	51	M	3.9	1	1	2	2	1	2	1	2	1	2	1	2	1	2	1
113	347824	42	M	4.1	1	2	1	2	1	2	1	1	1	1	1	1	1	2	2
114	531831	43	M	4.9	1	2	1	1	1	2	1	2	1	2	1	1	2	1	1
115	525908	32	F	18.3	4	1	2	1	2	2	1	2	2	1	2	2	2	2	2
116	560793	67	F	10.9	2	1	1	1	1	2	1	2	2	2	1	1	2	2	2
117	524651	66	M	1.1	1	1	1	1	1	2	2	2	2	1	1	2	1	1	1
118	569367	45	F	18.9	5	2	2	2	2	2	1	2	2	2	2	1	2	2	2

119	319999	39	F	4.1	1	2	1	2	1	2	1	2	2	1	1	2	1	1	2
120	616103	43	M	6.8	1	2	1	1	1	1	2	1	1	2	2	1	1	1	1
121	288101	70	F	4.3	1	1	1	2	2	1	1	2	2	2	1	1	1	2	2
122	322552	65	F	6.9	2	2	1	1	2	1	2	2	2	2	2	1	2	2	2
123	615311	43	F	10.5	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1
124	646805	66	F	6.8	1	2	1	1	2	2	2	2	1	1	2	1	2	1	1
125	476275	65	M	9.1	2	1	2	1	1	2	1	1	1	2	2	1	2	1	1
126	347163	62	M	13.2	3	2	2	2	1	1	2	1	1	2	2	2	2	1	1
127	483108	45	M	7.1	2	1	2	2	2	1	2	2	1	2	1	2	2	1	2
128	386997	35	F	8.2	2	2	1	1	2	2	1	1	1	1	2	2	2	2	2
129	504858	62	F	17.4	4	2	2	1	2	1	1	1	2	2	2	1	1	2	1
130	539043	47	F	10.2	2	1	1	1	1	2	1	1	1	1	2	2	1	1	2
131	361654	38	M	1.2	1	1	1	2	1	2	2	1	1	1	2	2	1	2	2
132	454970	42	F	15.2	3	1	1	1	2	1	2	1	2	1	2	2	2	2	1
133	316800	49	M	14.9	3	1	1	1	1	2	2	1	2	2	2	1	2	2	2
134	286251	38	M	18.9	5	1	2	1	2	2	1	2	1	1	2	2	1	1	2
135	538389	56	M	6.5	1	1	2	1	1	2	2	2	1	1	1	1	1	1	1
136	282546	60	F	4.8	1	2	1	2	2	1	2	2	1	2	2	2	2	2	1
137	621791	59	M	11.5	2	1	2	2	1	1	2	2	2	2	1	1	2	2	1
138	354066	39	M	13	3	1	1	2	1	2	1	2	1	1	2	1	2	1	1
139	361722	57	M	11.7	2	1	1	1	1	2	2	1	2	2	2	2	1	1	2
140	266169	56	M	13.5	3	1	2	1	1	2	1	1	2	1	1	2	1	1	1
141	553958	49	M	13.9	3	1	1	2	1	1	2	1	2	2	1	1	2	1	2
142	269482	48	M	17.7	4	2	1	2	1	2	2	2	1	1	2	1	1	2	2
143	515770	64	F	4.9	1	2	1	1	2	1	1	1	2	1	1	1	2	1	1
144	563053	64	M	15.3	3	1	1	1	2	1	1	1	1	1	1	2	2	2	1
145	383928	60	F	5.3	1	1	1	2	1	1	1	2	2	1	2	1	1	2	2
146	352440	65	F	12.5	2	2	1	1	1	1	2	1	2	2	2	2	1	2	1
147	406420	44	F	12.7	2	2	1	1	1	1	2	2	1	1	1	2	1	2	2
148	483557	53	F	1.7	1	1	1	2	2	2	1	1	2	1	1	1	2	1	1

149	478747	59	F	15.4	3	1	2	1	1	1	2	1	2	2	1	1	2	1	2
150	648365	39	M	4.6	1	2	1	2	1	1	1	2	2	1	1	1	1	2	1
151	534121	38	F	9.2	2	2	2	1	1	2	2	2	2	2	2	2	1	1	2
152	541757	69	F	8.3	2	1	1	2	2	2	2	2	2	1	1	2	2	1	2
153	436825	60	M	17.1	4	1	1	2	1	2	2	2	2	2	1	2	1	1	1
154	353118	51	F	8.4	2	2	2	1	2	2	1	1	1	1	1	2	1	2	1
155	305003	45	F	10.9	2	1	2	1	2	2	1	2	1	2	1	2	2	2	2
156	360607	49	M	1.1	1	1	2	2	1	1	2	1	1	2	2	2	1	2	1
157	543726	30	F	18.9	5	2	1	2	1	2	1	2	2	1	2	1	2	1	1
158	419194	67	M	2	1	2	1	2	1	2	2	2	1	1	1	1	1	2	1
159	522704	67	M	14.3	3	1	2	1	1	1	2	1	2	1	1	2	1	2	1
160	520668	47	F	4	1	1	2	1	2	2	2	2	2	1	1	2	1	2	2
161	539608	41	F	7.1	2	1	1	1	2	2	1	2	1	1	1	2	1	2	1
162	268840	65	F	15.2	3	2	2	2	2	1	2	2	2	2	1	1	1	1	1
163	495043	64	F	9.2	2	2	1	2	2	1	2	1	1	1	1	1	1	1	2
164	330876	42	M	19.4	5	2	1	1	1	1	1	2	1	1	2	1	1	2	2
165	535861	61	M	12.2	2	1	2	1	2	1	1	2	1	2	1	1	2	2	2
166	467464	56	M	2.8	1	2	1	2	2	1	2	2	2	2	2	2	2	2	2
167	405182	42	F	7.3	2	1	2	1	1	1	2	1	2	2	2	1	2	2	1
168	336246	59	M	6	1	2	2	1	1	1	2	1	2	1	1	1	2	1	2
169	362106	40	F	19.1	5	1	2	1	2	1	2	2	1	1	2	2	2	2	2
170	531506	36	F	2.5	1	1	1	2	2	2	1	1	1	2	1	1	2	1	2
171	480001	63	M	2.4	1	1	1	2	1	1	1	1	2	1	1	2	1	1	1
172	506374	47	F	17.9	4	2	2	1	2	2	2	2	1	2	1	2	1	2	2
173	394582	62	M	17	3	2	1	1	1	2	1	2	1	1	1	1	2	1	2
174	551457	34	F	12.8	2	1	2	1	1	2	1	1	2	2	2	2	1	1	2
175	445531	65	F	7	2	1	2	1	1	1	2	2	1	1	1	1	2	2	1
176	332974	50	M	17.2	4	1	1	2	2	1	2	2	1	2	2	1	1	2	1
177	258119	39	F	8.1	2	2	1	2	2	1	1	2	2	1	2	2	1	2	2
178	366684	42	F	14.2	3	1	1	2	2	2	2	2	2	1	2	1	1	1	2

179	352111	55	F	18.4	4	1	2	2	2	1	2	2	2	1	2	2	2	1	1
180	603039	63	F	8.7	2	1	1	1	1	2	1	2	1	2	2	1	2	2	1
181	447798	30	F	8.7	2	1	1	2	2	1	2	1	1	1	1	2	2	2	2
182	278762	40	M	18.3	4	2	1	2	1	1	1	1	1	2	2	1	1	1	1
183	439356	34	F	9.9	2	2	1	1	2	2	1	1	2	1	2	1	1	1	2
184	410741	51	F	2.1	1	1	1	2	1	2	2	2	2	1	2	2	2	1	1
185	601027	44	M	19.6	5	2	2	2	1	1	2	1	2	1	2	2	1	1	1
186	503695	35	F	11.3	2	2	1	1	2	1	2	2	2	2	1	2	1	2	2
187	619141	32	M	19.2	5	1	2	1	1	2	2	2	2	1	2	1	1	2	2
188	386929	59	F	17.1	4	2	2	1	2	1	1	1	1	2	1	2	1	2	1
189	376494	67	M	18	4	2	2	2	2	1	1	1	2	1	2	2	1	1	2
190	293886	39	M	13	2	1	1	1	1	1	2	2	1	1	2	1	1	1	1
191	296749	51	F	16.6	3	1	1	2	2	1	2	2	1	1	1	1	1	2	2
192	487843	36	M	9.7	2	2	2	2	2	2	1	1	1	2	1	2	2	1	1
193	647902	36	M	1.8	1	2	2	2	1	1	1	2	1	1	1	1	2	2	2
194	460483	34	F	3	1	1	2	1	2	1	2	2	1	1	1	1	2	1	1
195	273466	56	M	7.1	2	1	1	2	1	1	2	2	1	2	2	2	1	2	2
196	322544	53	M	10.6	2	2	2	2	2	2	2	1	2	1	1	2	2	1	1
197	574241	33	F	5.1	1	2	1	1	2	1	2	2	2	2	1	2	2	2	1
198	428733	33	M	19.5	5	1	2	2	1	1	1	1	2	1	2	2	1	1	1
199	433607	70	F	16.9	3	2	2	2	2	1	1	2	1	1	1	2	1	1	2
200	351384	35	F	9.3	2	2	2	1	1	2	2	2	1	2	2	2	1	1	1
201	422609	37	M	8.1	2	1	2	1	1	2	2	1	2	2	1	2	2	1	2
202	354081	59	F	14.8	3	2	1	1	2	2	1	1	1	2	1	1	1	2	1
203	256854	55	M	13.4	3	2	2	2	2	1	2	2	1	1	2	1	1	2	2
204	426554	69	M	3.2	1	1	1	2	1	1	1	2	1	1	2	1	2	1	2
205	271147	61	M	8.4	2	1	1	2	1	1	2	1	1	2	2	2	2	1	2
206	441052	43	M	13.7	3	2	1	2	1	1	2	2	1	1	1	1	1	1	1
207	335012	38	M	3.7	1	1	2	2	1	2	1	2	2	1	2	1	1	2	2
208	525686	34	M	2.3	1	2	1	1	1	1	1	2	2	2	1	2	1	2	2

209	538068	70	M	13.8	3	1	2	2	2	2	1	2	2	1	1	1	2	2	1
210	310354	32	M	13.7	3	2	1	2	1	2	2	1	2	1	1	2	2	2	1
211	403365	69	M	7.6	2	1	2	2	2	2	1	2	1	2	2	1	2	2	2
212	327332	50	M	2	1	2	1	2	1	1	1	2	2	2	1	1	1	2	1
213	319348	48	M	3.6	1	1	1	2	2	1	1	1	1	2	2	1	1	2	2
214	628840	69	F	8.2	2	2	2	2	1	2	2	1	2	2	2	1	2	2	1
215	477573	42	F	3.2	1	1	2	2	2	1	2	2	1	1	1	1	2	1	2
216	391015	49	F	10.8	2	2	1	1	2	2	2	1	2	2	2	1	2	1	1
217	522991	42	F	16.4	3	2	1	1	1	2	2	2	2	1	2	1	2	1	1
218	305183	49	F	9.4	2	2	1	1	1	2	1	1	1	2	2	1	2	2	1
219	493506	55	M	19.3	5	2	1	1	1	2	1	1	2	2	1	2	1	2	1
220	364716	64	F	4.3	1	1	2	2	1	2	2	2	2	2	2	1	2	2	1
221	426858	36	M	11.6	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2
222	303859	38	F	19.3	5	1	1	2	1	1	2	1	1	1	2	1	2	1	2
223	256169	67	F	3	1	1	2	2	2	1	1	2	1	1	2	1	1	1	1
224	432338	38	F	2.3	1	2	1	1	2	1	2	1	2	1	1	2	2	1	1
225	266116	54	F	2	1	2	2	1	1	2	1	1	2	1	2	1	1	1	1
226	596486	62	M	7	2	1	1	1	1	2	2	1	1	1	2	1	1	1	1
227	286847	63	M	15.6	3	1	1	2	2	2	1	2	2	2	2	1	2	1	1
228	511775	31	M	9.1	2	2	2	1	2	2	1	2	1	1	1	1	1	1	1
229	334919	47	M	5.3	1	2	2	1	1	1	1	1	2	1	1	2	1	1	2
230	605885	53	M	18.2	4	1	1	2	1	2	2	1	2	1	1	1	1	1	2
231	463491	47	F	14.1	3	2	1	1	2	2	1	1	1	1	1	1	2	2	1
232	603139	41	M	16	3	2	1	1	1	2	2	2	1	2	1	1	1	1	2
233	523649	30	F	10.5	2	1	1	2	2	1	2	1	1	2	2	2	2	2	2
234	547587	65	M	15.5	3	1	2	1	2	1	2	2	1	1	2	1	1	1	2
235	383933	68	F	10.3	2	1	1	2	2	2	1	2	1	1	2	2	1	2	2
236	422901	31	F	6.7	1	1	1	2	1	1	1	2	1	1	1	2	1	2	2
237	288952	42	F	5.7	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1
238	490089	47	M	18.3	4	2	1	1	1	2	1	2	2	2	1	2	1	2	2

239	375699	57	F	7	2	1	1	1	1	1	1	2	1	1	1	2	1	2	1
240	380266	62	M	18.8	5	2	2	1	1	2	2	1	1	1	1	1	2	1	2
241	257725	53	M	1.9	1	1	2	1	1	1	2	2	2	2	2	2	1	1	2
242	334542	40	F	12.4	2	2	2	2	1	1	2	1	1	2	1	2	1	2	2
243	553577	39	F	9.7	2	1	1	1	1	1	2	1	1	2	2	2	1	2	1
244	371715	43	F	2.2	1	1	2	2	1	1	2	2	1	1	2	2	2	1	1
245	530421	41	M	6.3	1	2	2	2	2	2	1	1	1	1	2	2	1	1	2
246	265004	55	F	12.6	2	1	2	2	1	1	1	2	1	2	2	1	1	1	1
247	457240	55	F	17.7	4	2	1	1	1	1	2	2	2	1	1	2	2	2	2
248	464129	45	F	1.7	1	1	2	2	2	2	2	1	1	1	1	1	2	2	1
249	424538	41	M	15.5	3	2	2	2	1	1	2	2	2	2	2	2	1	2	2
250	618415	65	M	3	1	1	2	2	1	1	1	1	2	1	1	1	2	2	1
251	271105	60	F	18.8	4	2	1	2	2	1	2	2	2	2	2	2	1	2	1
252	266708	46	M	16.6	3	2	1	2	1	2	2	2	2	2	2	2	2	2	1
253	345622	50	F	8.7	2	2	2	1	1	1	2	2	2	2	2	1	1	1	1
254	602882	37	F	15.6	3	2	1	2	2	1	2	1	1	2	2	2	2	1	1
255	310211	48	F	13.1	3	1	1	1	1	2	2	1	2	1	2	1	2	2	1
256	626676	64	M	5.1	1	1	2	1	2	1	1	1	1	1	2	1	1	1	2
257	606822	64	M	13.1	3	1	1	1	1	1	1	1	1	1	1	2	1	1	2
258	747554	53	F	3.8	1	1	2	1	1	1	2	2	2	1	2	1	2	1	2
259	454981	57	F	3.7	1	2	1	1	1	2	1	2	1	2	1	1	1	1	2
260	507542	66	F	1.6	1	2	1	1	2	1	1	2	2	1	2	2	2	2	1
261	654804	48	M	6.5	1	2	2	2	1	2	2	1	2	2	2	2	1	2	2
262	62145	57	M	16.9	3	1	2	1	1	2	1	2	2	1	2	2	2	2	2
263	352001	50	M	11	2	2	1	1	2	2	1	1	2	1	2	1	1	1	2
264	86841	60	F	4.8	1	1	2	2	1	2	2	1	2	2	1	1	2	2	2
265	580419	64	M	11.3	2	2	1	1	2	1	2	2	1	1	2	2	1	1	1
266	209790	54	M	15.5	3	2	1	2	1	2	1	2	2	2	1	1	2	2	1
267	440338	63	M	14.7	3	2	1	1	1	2	2	2	1	1	2	2	1	1	2
268	397670	52	M	17.6	4	1	1	1	2	1	1	1	1	1	1	1	1	2	2

269	325359	51	F	1.7	1	1	2	2	2	2	2	1	1	2	1	1	1	2	2
270	503628	49	M	19.8	5	2	1	2	2	1	2	2	2	1	2	1	1	1	2
271	177015	69	M	5.9	1	2	1	2	1	1	2	2	2	1	2	2	2	2	2
272	377171	63	F	13	2	2	2	2	2	2	2	2	1	2	2	1	1	2	2
273	764008	50	F	16.1	3	1	2	1	1	1	2	2	1	1	2	1	1	2	1
274	434061	39	M	6	1	2	1	1	1	2	2	2	1	1	2	1	1	1	1
275	784786	37	F	7.3	2	2	1	1	1	2	2	2	1	1	1	1	2	2	1
276	618433	38	M	12.8	2	1	2	1	1	1	1	2	1	1	2	2	1	1	1
277	123184	55	M	7.2	2	2	2	1	2	1	1	1	2	1	2	2	1	1	2
278	304962	49	M	2.7	1	1	2	2	2	2	2	1	2	1	1	1	2	2	2
279	557710	48	F	6.7	1	1	1	1	2	2	2	2	2	2	1	1	2	2	1
280	159894	60	F	5.9	1	2	1	1	1	2	1	2	1	2	1	2	1	1	1
281	81162	59	M	10.8	2	1	1	2	1	1	2	2	1	1	2	1	2	2	1
282	498736	32	F	12.1	2	1	1	2	1	2	1	1	2	1	1	2	2	2	1
283	470640	53	F	2.9	1	2	1	2	2	2	1	1	1	2	1	1	1	2	2
284	298592	46	M	7	2	2	2	1	1	1	2	2	2	2	1	2	1	1	1
285	846261	67	F	19.6	5	2	1	2	1	2	2	1	1	2	2	2	2	1	2
286	743613	50	M	19.5	5	1	2	2	1	2	2	1	1	1	1	1	1	1	1
287	149958	53	M	15.1	3	2	2	1	2	2	2	1	1	2	2	2	2	2	1
288	91002	36	M	17.1	4	1	1	1	2	2	2	2	2	1	2	2	1	1	1
289	145855	61	M	3.1	1	1	2	1	1	1	2	1	2	1	1	1	1	2	2
290	624341	35	F	6.7	1	1	2	1	2	2	1	1	2	1	1	2	1	2	1
291	408802	43	M	11.9	2	2	2	1	1	1	1	1	1	1	2	2	1	1	1
292	134697	56	F	2.9	1	2	1	2	1	2	2	1	1	2	1	2	2	2	2
293	777559	59	M	12.7	2	1	2	2	1	1	1	1	1	2	1	2	1	2	1
294	255576	40	M	10.1	2	2	1	1	1	2	2	2	1	1	1	1	1	1	1
295	532382	67	F	11.8	2	2	1	1	2	2	2	1	2	2	2	1	2	2	2
296	401330	53	F	6.9	2	2	2	2	1	2	2	2	1	2	1	1	1	1	1
297	452568	47	M	16.3	3	2	1	1	2	2	2	2	1	1	2	2	2	1	1
298	705226	58	F	14.3	3	1	1	1	2	1	2	2	1	1	1	1	1	2	1

299	130370	35	F	9.4	2	1	2	2	2	1	1	2	2	1	1	2	2	1	1
300	91131	62	F	3.4	1	1	2	2	2	2	2	1	2	2	1	1	2	2	2
301	224723	68	M	3	1	2	2	1	2	1	1	2	1	1	1	2	2	1	2
302	222890	46	M	16.8	3	2	2	1	2	1	1	2	1	1	2	1	1	1	1
303	830275	55	M	16.9	3	1	2	1	2	1	1	1	1	2	2	2	2	1	2
304	174574	36	F	7.3	2	1	2	1	1	1	2	1	1	1	2	1	1	2	1
305	654908	43	F	3.6	1	1	1	2	2	1	2	2	1	2	1	2	2	2	2
306	125101	53	M	4.9	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1
307	393294	38	F	9.8	2	2	2	2	1	2	2	2	2	1	1	1	2	1	1
308	311984	41	F	14.6	3	1	2	1	2	2	2	1	1	2	2	1	2	1	1
309	652763	52	M	7.1	2	2	1	2	1	1	1	2	2	2	2	2	2	2	2
310	134213	70	M	10.8	2	2	2	1	1	2	1	1	1	1	2	2	2	2	2
311	201108	31	F	17.4	4	2	1	1	1	1	1	2	1	1	1	1	1	1	1
312	184828	56	F	15.3	3	2	2	2	2	2	2	1	2	1	2	2	1	2	2
313	577492	36	M	4.5	1	2	1	2	1	1	2	2	1	1	2	2	2	1	2
314	571682	66	F	11.7	2	2	2	1	1	1	1	2	1	1	1	1	2	1	2